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Collective Review

CONGENITAL CHOLEDOCHAL CYST, WITH A REPORT OF 2, AND AN ANALYSIS OF 94, CASES

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CONGENITAL CHOLEDOCHAL CYST has been generally considered as a rarity, but the number of cases reported in the literature increases steadily in proportion to the awareness of this entity on the part of the medical profession. The review of Tsardakas and Robnett published in February, 1956 (133) included 232 cases. In the past 2 years we have been able to find 161 more cases in the literature. These figures suggest that many more cases are now diagnosed, and the total number of cases reported is not a reliable exponent of the incidence of the disease.

Recognition and proper treatment signify a completely different outcome as far as mortality and morbidity are concerned. The study of many cases demonstrates that the multiple operations to which the patients were submitted could be avoided.

Three cases of congenital choledochal cyst were operated upon at Mercy Hospital since 1940. The first case was reported by Hutchins and Mansdorfer in 1944 (58). A follow-up of 14 years is given in this study. The other 2 cases will be reported here in detail.

Case Report No. 1. Miss E.J.B., a 20 year old white female was admitted to the hospital on January 29, 1951 with the chief complaint of abdominal pain. About 5 years prior to admission she began to have periodic indigestion and epigastric distress, particularly after heavy meals or fatty foods. More recently she developed infrequent recurrent cramplike pain in the upper abdomen. Occasionally she noticed light-colored stools and dark urine. She was generally constipated. During the few weeks prior to admission her pain became more severe and constant with some nausea.

Her past history was essentially negative except for an appendectomy elsewhere which did not relieve the patient's complaint.

Physical examination disclosed a well developed, well nourished, white female in no acute distress. The abdominal pain had been absent for the 3 days prior to admission. The temperature, pulse, and respiration were normal. The blood pressure was 106 systolic and 66 diastolic. The physical examination was negative, although slight tenderness in the epigastrium and right upper quadrant of the abdomen was elicited and slight icterus was noted in the conjunctiva. No abdominal masses were palpable.

A clinical impression of cholecystitis and

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cholelithiasis with possible choledocholithiasis was made.

The laboratory data were as follows: complete urine analysis was negative except for urobilinogen (3+) and bilirubin (1+), and it was positive for bile.

Examination of the blood showed: hemoglobin 78 per cent, 11.8 gram, white blood count 6,050 with 47 per cent polymorphonuclear cells, 45 per cent lymphocytes, and 4 per cent eosinophils. In milligrams per cent the fasting blood sugar was 92, the urea 16, the urea nitrogen 7, the serum cholesterol 210, and the cholesterol esters 104. The total serum proteins were 7.7 grams, the albumin 4.6 and the globulin 3.1. The van den Bergh test showed a prompt direct positive serum bilirubin of 1.6, an icteric index of 12, and a thymol turbidity of 4.2 units; the cephalin flocculation was negative in 24 hours. The alkaline phosphatase was 8.3 units, the prothrombin time was 15 seconds with undiluted plasma and 54 seconds with 12.5 per cent diluted plasma. The results of Kahn and Hinton serological studies were negative.

Stool examination was positive for bile, but negative for blood, ova, and parasites.

The patient was operated upon on January 29, 1951. A right upper rectus incision was made under spinal anesthesia later supplemented with sodium pentothal. Upon entering the abdominal cavity a small gallbladder was found, which contained no stones. Lying adjacent to the inferior surface of the liver was a cystic mass the size of a large grapefruit. The cyst was aspirated with a hypodermic needle and found to contain bile. It was then evacuated with a large needle and about 2 liters of bile were removed. An incision was then made in the cyst and it was explored from the inside. The hepatic ducts entered the upper portion of the cyst and the cystic duct entered the lateral portion. They were found to be dilated. No opening into the duodenum could be demonstrated. A choledochocystoduodenostomy was then performed.

The postoperative course was uneventful except for a temperature of 37.7 degrees Centigrade for 4 days, which on the fifth day reached a peak of 38.7 degrees. After the seventh day the patient was afebrile. She was discharged on the twelfth postoperative day and has been completely asymptomatic since except for one episode of abdominal pain and vomiting which was of uncertain etiology and of short duration.

Case Report No. 2. M.G., an 18 year old married white female, came to this country from her native country, Italy, on December 20, 1956. On February 25, 1957, she was admitted to the medical service of Mercy Hospital with the chief complaint of vague right upper quadrant abdominal pain. The pain had a gradual onset about one week prior to admission. It was nonradiating, unaffected by exercise or food intake, and not relieved by drugs. She complained of mild malaise and anorexia, and vomited on three occasions during the 4 days prior to admission. The family noticed jaundice for about 3 days and there was generalized pruritus. The patient denied chills, fever, intolerance to fatty food, weight loss, or any previous illness. A review of her other organic systems was completely negative. She had received the routine immunization shots prior to entering the United States. Her family history was not contributory.

Physical examination revealed the patient to be a well developed, well nourished, white female in no acute distress. The temperature was 36.6 degrees Centigrade orally, her pulse 74, and respiration 19. The blood pressure was 120 systolic and 80 diastolic. The skin and mucous membranes were markedly icteric. Examination of the head, eyes, ears, nose, throat, mouth, and neck were negative. The lungs were clear to auscultation and percussion. The heart was not enlarged, and there was a normal sinus rhythm. At the apex there was a grade I systolic murmur which was not transmitted. The sounds were otherwise of good quality. The abdomen was enlarged, particularly on the right side. The left side of the abdomen was tympanitic, but on the right the percussion note was more dull. No free fluid was noted. The entire right side of the abdomen was slightly tender, but there was no rigidity. The liver was believed to be somewhat enlarged, but its lower edge could not be delineated in that it seemed to fuse with a large mass which occupied the entire right side of the abdomen, extending well beyond the midline (Fig. 1).

The mass seemed to be rather fixed except for slight movement with respiration. There was some question as to whether there was a hollow viscus overlying the mass. The mass was firm and smooth. Bowel sounds were active. The rest of the physical examination was within normal limits.

Laboratory data and special studies. Examination

FIG. 1.

FIG. 2.

of the blood revealed a hemoglobin of 80 per cent, 12 grams, a hematocrit of 37, and 4.33 million red blood cells; a white blood count of 6,350 with 62 per cent polymorphonuclears, 37 per cent lymphocytes, and 1 per cent monocytes. The absolute eosinophil count was 33. The bleeding time was one minute and the coagulation time was 8 minutes and 45 seconds. The platelets numbered 448,000. The corrected reading of the sedimentation rate was 30. The Kahn and Hinton serological studies were negative. The serum electrolytes in milliequivalents were: sodium 128.5, potassium 3.75, chloride 102.8, and carbon dioxide 22.1. The serum iron level was 106 micrograms. Urinalysis revealed: a clear amber color, specific gravity 1.020, an acid reaction, sugar negative, a trace of albumin, acetone negative, and microscopic examination negative. Tests for the presence of bile were positive; the urobilinogen was 4+ and on the following day was 1+; the bilirubin was 4+. Stool examination revealed that a normal amount of bile was present. The blood sugar (fasting) was 118 milligrams per cent, the urea 17, the urea nitrogen 8, the serum cholesterol 360, and the cholesterol esters 65. The serum albumin was 4.1 grams and the globulin 3.2 grams. The prothrombin time was 14 seconds with undiluted plasma and 82 seconds with 12.5 per cent diluted plasma. The alkaline phosphatase was 14.7 units and the serum amylase 308. The van den Bergh reaction showed a direct bilirubin of 10.4 milligrams per cent in one minute, 12.4 in 30 minutes, and a total of 15.8 milligrams per cent. The icteric index was 55; the cephalin flocculation negative, and the thymol showed 2 units.

Sigmoidoscopic examination was normal.

The electrocardiogram was read as a normal variant.

As to the roentgenologic studies, the chest roentgenogram was negative. The abdominal flat film (Fig. 2) showed a huge rounded mass occupying the upper two-thirds of the right abdomen and extending across the midline where it displaced the large bowel to the left. No calcifications were seen within it. The right kidney

FIG. 3.

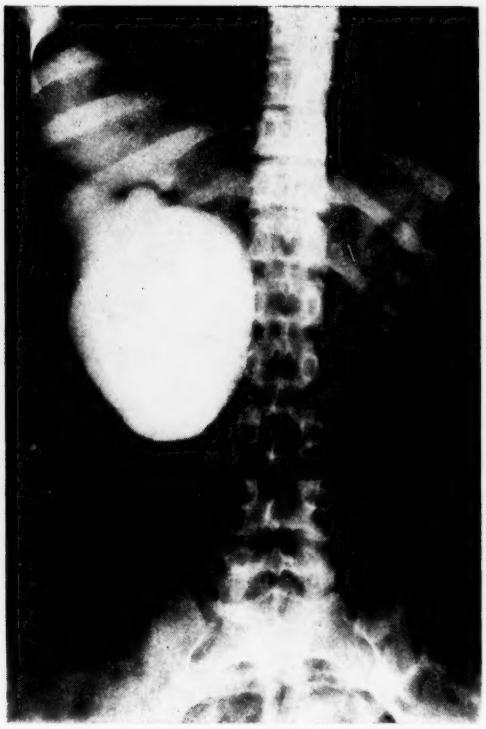

FIG. 4.

shadow could be seen through the mass and appeared to be normal in size. The inferior border appeared to be atypical for the usual type of liver enlargement. There was no evidence of splenic enlargement. The radiologist's interpretation was either a large hepatic cyst or tumor.

Preoperative course. During the first 48 hours after admission, the jaundice increased, the temperature climbed to 38.3 degrees Centigrade, and the patient began to vomit bile-stained gastric contents. Surgical consultation was requested and exploratory laparotomy advised. The preoperative diagnosis was cystic mass in the right upper quadrant, probably pancreatic cyst, hydrops of the gallbladder, or cystic dilatation of the common duct.

On February 28, 1957, under endotracheal anesthesia and through a right paramedian incision, an exploratory laparotomy was performed. A large cystic mass was identified, displacing the duodenum which was adherent to it against the anterior abdominal wall. Dissection was started to confirm the nature of the cyst and its anatomical relations. At this point, to increase the exposure, the cyst was opened and about 4,500 cubic centimeters of thick dark greenish fluid were obtained. The lining of the cyst, which was not characteristic, was inspected and a 2 centimeter diameter opening was seen on the upper posterior wall. A large catheter was passed into the opening and was felt to go into the hilum of the liver (Fig. 6). The gallbladder was of normal size, without stones, and was visualized lying between the cyst and the slightly enlarged liver. The cystic duct and the duct leading from the cyst could not be visualized because of rather dense adhesions about the cyst. At this point the patient's condition began to deteriorate and it was thought that further dissection should be abandoned. A portion of the wall of the cyst was removed for microscopic study. The most dependent portion of the cyst was then anastomosed to the second portion of the duodenum. The stoma measured about 6 centimeters. A Foley catheter was then placed in the cyst and brought out of the abdomen through a stab wound for

FIG. 5.

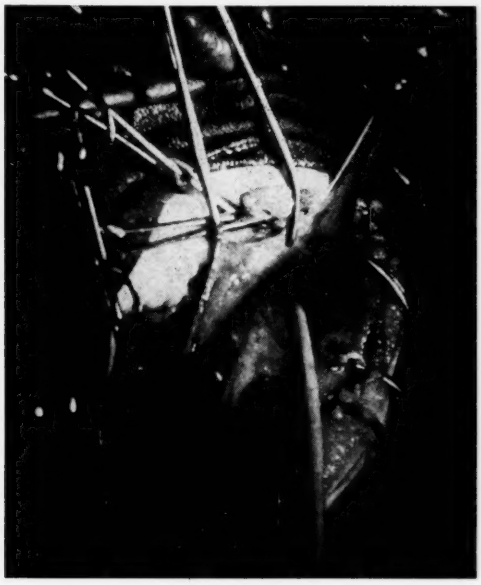

FIG. 6.

further x-ray studies and to drain what was thought to be a huge cystic dilatation of the common duct. The abdominal wall was then closed. The fluid removed from the cyst was strongly positive for bile and the amylase level was 2,741 units. The microscopic section of the cyst wall showed fibrocollagenous tissue and smooth muscle, a low grade productive inflammation, and no recognizable epithelial lining. The postoperative course was rather stormy with shock controlled by transfusions, fever, and an increase in the jaundice. As the jaundice cleared an intravenous cholangiogram did not visualize the biliary tree. Injection of radiopaque dye through the catheter into the cyst failed to reveal the opening that was demonstrated at laparotomy, or any dye in the duodenum. The patient was discharged April 3, 1957 with a draining fistula from the cyst.

The patient was followed up in the outpatient department and remained slightly jaundiced. The fistula continued to drain and the patient complained of upper right quadrant abdominal pain. A second attempt was made to visualize the biliary tree through the fistula and cyst and this was unsuccessful except to show that the cyst had decreased in size (Figures 3 and 4). It was believed that the anastomosis had closed and the patient was readmitted for definitive surgery on June 30, 1957.

On July 2, 1957 the patient was explored by one of us (F.A.L.) and, after considerable meticulous dissection, the cyst and the related anatomy were defined (Fig. 5). The common hepatic duct entered the upper posterior wall of the cyst and was somewhat dilated (Figure 6). The cystic duct arose from the superior lateral side of the cyst. The previous anastomosis between the cyst and duodenum was completely closed. A diminutive duct which was only a few millimeters long connected the cyst with the duodenum. This was ligated and divided. The cyst was removed, including the gallbladder and the cystic duct. The common hepatic duct, which measured 18 millimeters in diameter, was anastomosed to the second portion of the duodenum. No internal support was used because of the large size of the duct. The patient withstood the procedure fairly well, and the appendix was also removed. The subhepatic space was drained with a large cigarette drain through a stab wound. The incision was then closed in layers. After removal, the shrunken cyst measured 20 by 15 centimeters. The wall of the cyst measured 1 centimeter in thickness. Microscopic examination revealed isolated segments of columnar epithelium in the

TABLE I.—LABORATORY DATA

Date	*7-1*	*7-3*	*7-5*	*7-7*	*7-8*	*7-10*	*7-11*	*7-13*	*7-16*	*7-18*	*7-20*	*7-22*	*7-23*	*7-29*	*8-5*
Cholesterol mgm. %	155														168
Cholesterol esters mgm. %	92														95
Blood sugar mgm. %	87		144				139			116	110		93	81	92
Blood urea mgm. %	7		19				22			112	43		18	9	10
Urea nitrogen	3		9				10			51	20		8	4	4
Serum: Chlorides mEq/L		101.8	92.2		94.6		98	91.2		101	104		97.8		106.0
Serum: Sodium mEq/L		136.7	132		128		118.3	134.8		111	126		135.3	120.3	141
Serum: Potassium mEq/L		4.2	3.72				4.11	4.98		6.10	5.8		4.02	3.35	4.34
Serum: Co_2 vol/L		47	51	40			29	48		24	28		43	51	55
Serum: Co_2 mEq/L		21.1	22.9	18.8			13.1	22.1		10.8	12.6		19.4	22.9	23.3
Serum: Albumin gm.	3.6			3.7			4.1								3.9
Serum: Globulin gm.	3.4			3.5			4.1								3.9
Serum: Amylase (units)		302	134				216	316						355	133
Serum: v.den Bergh mgm. %															
Serum: 1m.	0.6		11.8				2.6	3.2			0.8			0.6	0.6
Serum: 30m.	0.8		14.0				3.2	4.6			2.2			0.9	0.7
Serum: Serum bilirubin	0.9		15.4				5.2	6.4			2.6			1.0	1.0
Icterus index			188				30	43				18		7.6	3.6
Prothrombin time: Undil.	18″		22″	18″											
Prothrombin time: 12.5%	70″		143″	70″											
Alkaline phosphatase (units)	3.9						14.9	11.2			4.3		6.4		6.6
Ceph. floc. (24 hours)	†						†	† † †							
Ceph. floc. (48 hours)	†† †						† † †	† † †							
Thymol turbidity (units)	3						4								1
Hemoglobin (Gm.)	12.5	17.6	16.5	14.3	14.8	15.9	14.9	13.3	14.5	14.8	13		10.1	10.8	12.9
Hemoglobin (%)	83	107	111	95		107	99	88	96	98	86		67	72	85
Red blood cells	4.44	5.66	6.11	5.66		6.11	5.33	4.74	5.44	5.33	4.88		3.38	4.00	4.44
White blood cells	5,200	16,050	15,500	14,450		33,900	28,250	16,000	27,200	23,300	17,000		10,000	7,000	7,550
Differential: Seg.	50	57	76	77		74	88	80	82	75	60		91	72	60
Differential: St.	1	19	5	4		4	2	1		11	11		3	3	6
Differential: Lymph.	33	18	12	11		18	6	18	14	13	27		3	15	32
Differential: Mono.	11	6	7	8		4	4	1	4	1	2		2	7	2
Differential: Eos.	5												1	3	
Hematocrit	40	51	55	51	53	55	48	45	49	48	44		34	36	40
Bleeding time	1′38″														
Coagulation time	5′35″														
Creatinine										0.6					

lining. The remainder of the wall was similar to the previous description.

The postoperative course was again quite stormy, consisting primarily of fever and tachycardia. There was a mild postoperative wound infection which responded to antibiotics and drainage. A mild pleural reaction developed at the right base, but no fluid was ever found, and, lastly, because of the intravenous fluids, a superficial phlebitis developed in the left leg, which responded to routine therapy. For a complete summary of the laboratory data on this patient see Table I. The patient was discharged from the hospital one month after operation in good condition.

She has since been followed up in the outpatient department. She was last seen in March, 1958, at which time she was completely asymptomatic and had gained considerable weight. There was no jaundice. When a gastrointestinal series was performed with sodium methylglucamine diatrizoates 76 per cent (gastrografin), no opaque material could be forced into the biliary tree, although air was present (Fig. 7).

Addendum

After submission of this manuscript the patient was seen in November, 1958 at the obstetrical clinic; she was 5 months' pregnant and completely asymptomatic.

LITERATURE

The first authentic case was reported by Douglas in 1852 (37). Two other cases can be found in the literature prior to this date, but their authenticity is doubtful. One is found in the "Disertatio Inauguralis Medica" of Abrahamo Vatero in 1723 (137), and the other in the Dublin Hospital Reports in 1817; a case of Todd cited by McConnel (86).

Laverson (79), in 1909, reviewed 28 cases and Waller (138), in 1917, reviewed 35.

The most complete reviews of this subject are those of Seneque and Tailhefer (115), Zinninger

and Cash (154), Gross (51), Yotuyanagi (151), Bangerter (8), the excellent one of Shallow, Eger, and Wagner, Jr. (117) of 175 cases, augmented to 182 (118), and the recent one of Tsardakas and Robnett (133) of 242 cases.

The material for our study includes 403 authentic cases (Table II) and 16 doubtful cases (Table III). The case of Lörine and Strehlinger (80) is not analyzed in this review because the data are not available. Therefore, to our knowledge, 419 cases are the total number reported in the world literature. Of these 92 are analyzed, 5 are followed-up, and 2 are new cases.

ETIOLOGY

There are very few subjects in medicine submitted to more speculation than the etiology of this condition.

One group defends extrinsic or acquired factors:

1. The cyst may represent a complication of pregnancy
   a. By uterine pressure (Goldammer, 48).
   b. By kinking of the common bile duct secondary to descensus of the viscera after delivery (McWhorter, 88).
2. It may follow abdominal trauma (Kremer, 74).
3. Enlarged mesenteric nodes due mainly to tuberculosis may compress the common bile duct (Douglas, 37).
4. Stenosis of the intramural portion of the choledochus due to infection may cause dilatation secondarily (Edgeworth, 40).
5. Pancreatic adenoma may be responsible (Budde, 22).

A second more numerous and substantiated group that favors a congenital origin is divided into two subgroups, which believe as follows:

A. The primary cause is an obstructive factor localized at the junction of the choledochus with the duodenum.
   1. Abnormal trajectory of the common bile duct and angular insertion with the duodenum (4, 73, 108, 109, 112).
   2. Valvelike mechanism present in the ampulla (7, 30, 96, 124).
   3. Congenital stenosis of intraduodenal choledochus (77).
   4. A persistence of an epithelial occlusion (Böhm, 17).

FIG. 7.

   5. Neuromuscular inco-ordination of the sphincter of Oddi (Rolleston, 107).

B. The cystic dilatation is due to a condition originating in the common bile duct proper.
   1. Embryogenic malformation (46, 54, 113, 114).
   2. Congenital hypotonus of the wall (38, 71).
   3. Abortive diverticulum (Winternitz, 146).
   4. Weakness of the wall of the common bile duct due to the presence of pancreatic tissue (Budde, 22).
   5. "Autonomic neurodysplasia" (Weber, 140). The term megalocholedochus should be used in the light of the similarity to megalocolon and megaloureter. The same comparison was made recently by Saltz and Glaser (110).
   6. Inequality of proliferation of the epithelial cells at the stage when the primitive choledochus is still solid. This hypothesis is accepted by many (115, 133, 151).

TABLE II.—AUTHENTIC CASES AND SOURCES

Number	*Source*
122	Japanese literature a. Forty-eight cases from the review of Yotuyanagi(151) of 55 cases, the cases of Terrada and Yagi (130), Kuriyama (151), Isoda and Kameda(151), Akamine(151) and Kawaisi (151) (first case) are included because in disagreement with Shallow *et al.*(117). We think that they represent typical cases of congenital choledochal cysts of the first type. b. Seventy-two cases from the review of Hatano and Imoto (53) c. Two individual reports (6, 53) (analyzed in our review)
75	From the review of 83 cases by Zinninger and Cash (154)
23	From the review of Poate(101)
32	From the review by Shallow, Eger, and Wagner, Jr.(117)
57	Analyzed by Tsardakas and Robnett(133)
92	Individual reports analyzed in the review; 17 of these partially studied by Barbosa and Rate(9)
2	Author's cases reported in detail in this article
403	Total authentic cases

TABLE III.—CASES OF DOUBTFUL AUTHENTICITY

Number	*Source*	*Year of report*	*Reason of doubt*
1	Abrahamo Vatero(137)	1723	Apparently secondary to extrinsic pressure of the pancreas upon the common bile duct. See Vara-Lopez and Negrete(135)
1	Todd, Dublin Hospital reports cited by McConnel(86)	1817	Uniform dilatation of the entire extra-hepatic biliary tree, insufficient data, probably acquired dilatation
1	Reel and Burrell(102)	1922	Satisfactory results with improper treatment, cyst lined by epithelium, other reasons stated by Poate (101)
1	William and Smithwick(144)	1929	"Dilatation" of common bile duct; probably acquired, good result without adequate treatment
8	From the review of Yotuyanagi(151), cases of Tanaka, Kawaisi (second and third), Watanabe, Isimaru (first, second, third), and Sioda	1936	Insufficient and inconclusive data
3	From the review by Barbosa and Rate(9) third case of Smith (1946), second case of Keeley (1950), second case of Burguess and Cherry (1954)	1956	We quote Barbosa and Rate(9) but these cases were not reported in the references given (121, 68, 23)
1	Shena(111)	1951	"Uniform dilatation of the entire biliary tree" probably acquired
16	Total		

Ebner (39) in 1909 was the first author to visualize a combined theory, an abnormality of the course of the distal duct and a weakness of the wall of the proximal portion. Zipf (155), in 1929, felt that factors such as infection, kinking, spasm, or valvelike formation were superimposed on the congenital basis for the dilatation. Gross (51), in 1933, expressed the theory that the dilatation could be due to a congenital weakness of the wall which developed into a cystic dilatation when the intraductal pressure increased secondarily to obstruction.

In the light of modern embryology, physiology, and pathology of the biliary tree we also consider the congenital choledochal cyst to be caused by two factors—weakness of the wall of the common bile duct in a specific segment and obstruction distal to it. The first factor is always congenital, while the second, usually congenital, can also be acquired. The common bile duct in embryonic life is formed by a compact column of proliferating cells. These cells undergo vacuolation, and by a process of coalescence a channel is formed. During this phase of development an excessive localized proliferation with subsequent vacuolation would create a weakness of the wall, substantiated in a "protodilatation" status. The obstructive factor is represented in many cases by a hypotrophic distal common bile duct due to deficient proliferation and vacuolation in this embryonic phase. Several other anomalies reported in the literature, already mentioned, constitute examples of the acquired type.

The congenital origin of the protodilatation status is based on the following factors. The anomaly occurs in a specific segment of the common duct. The entity coincides with other congenital anomalies of the biliary tree: double common bile duct (127, 141), accessory hepatic duct (84), double gallbladder (66), absence of

the gallbladder (104), and atresia of the bile ducts (12). It is also associated with other congenital abnormalities such as agenesis, hypoplasia, or polycystic kidneys or megaureter as reported by Böttger (18). The clinical manifestations of the disease usually occur early in life, being found in the embryo by Heiliger (54), and in a newborn by Blummelkamp *et al.* (15).

The obstructive factor was clinically demonstrated by Caroli and Marcoulides (26), who performed roentgen manometric studies in 6 cases. In all of them it was necessary to exert pressures much above normal to overcome the obstruction and obtain passage of the dye into the duodenum. A pressure as high as 50 centimeters of water was required in one of these cases. The authors reached the conclusion that an obstructive factor was responsible for the condition.

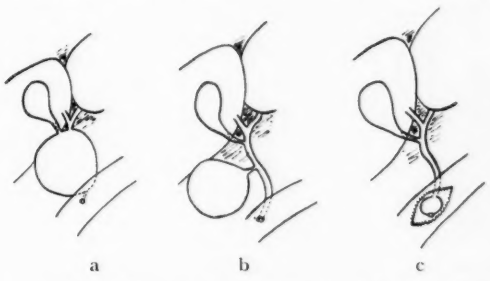

FIG. 8. a, Congenital cystic dilatation of the common bile duct. b, Congenital diverticulum of the common bile duct. c, Congenital choledochocele.

TERMINOLOGY

It is not surprising how much confusion exists in the literature concerning terminology and evaluation of operations performed by others because the disease manifests itself in three main anatomical types with different morphology. The disease is referred to as congenital or idiopathic. The enlargement is called cyst, cystic dilatation, dilatation, diverticulum, choledochocele, megacholedochus, megalocholedochus, megahepatocholedochus, cystic malformation, and retention cyst. Choledochus or choledochal, hepatocholedochus, and common bile duct are terms used to indicate the anatomical location. We were able to find 24 different titles to designate this entity by a combination of these words.

The study of the cases published impels us to attempt for the first time a classification based upon morphologic and anatomical features. We use three of the terms employed previously which we think are more adequate, respectively, for each type. We group them under the title of congenital choledochal cyst, in spite of the improper use of the word "cyst", to avoid confusion in the literature and because it describes with sufficient accuracy, the etiology, anatomical location, and morphological appearance of the three types (Fig. 8).

PATHOLOGICAL ANATOMY

The first type (Fig. 8a), which is the most common, is classically described by many authors. We agree with Tsardakas and Robnett (133) in proposing that this variety be called congenital cystic dilatation of the common bile duct, although these workers did not distinguish the other varieties. Anatomically, the biliary tree presents four features: (1) the intrahepatic tree is usually normal, (2) the biliary tree above the cystic dilatation is somewhat dilated secondary to the obstructive factor in the distal choledochus, (3) the cystic dilatation proper begins and ends sharply, (4) the terminal common bile duct is frequently narrowed. The cystic dilatation begins generally at the level of the cystic duct. The process seldom extends distally into the intramural portion of the common bile duct. In some cases the cystic duct joins the dilatation (117, 139) (our 2 new cases), and even the distal right and left hepatic ducts may be affected (44, 76). In these cases the gallbladder was reported normal, a finding which we were able to confirm in our cases. The fourth feature is encountered in the cases in which the obstructive factor originates from a deficient embryological proliferation, as mentioned previously under etiology. In our second case the distal common bile duct measured 2 millimeters. Cases are reported in which complete obliteration was found (117). In the cases in which other anomalies of the distal duct were reported, the common duct distal to the dilatation was normal in size or slightly dilated (greatly dilated in Fowler's case, 44).

The cystic dilatation varies greatly in size. Many giant cysts have been reported containing several liters. The second case of Shallow *et al.* (118) yielded 5,800 cubic centimeters. Many other workers reported similar amounts: Berger and Juglair (11), 5,500 cubic centimeters, Yotuyanagi (151) (second case) and Smith (121)

(first case), each 5,200 cubic centimeters, Fukada (151), 5,000 cubic centimeters; our second case yielded 4,500 cubic centimeters. In the case of Reel and Burrell (102) the cyst contained 8,000 cubic centimeters. An extremely large cyst is reported by Browne (21), in which the cyst was aspirated four times, with a total removal of 10 liters, and during operation, 13,340 cubic centimeters more were removed.

The wall of the cyst is usually thickened because of productive fibrosis and inflammation, measuring one centimeter in certain cases. Its anatomical nature is difficult to identify histologically. A dense connective tissue, fibrocollagenous and sometimes with smooth muscle and elastic elements, is encountered. Occasionally, glands are present. Generally, there is no epithelial lining, but islets of cylindrical or columnar epithelium may be preserved.

The degree of obstruction influences the quality of the bile contained in the cyst. In cases of complete obstruction with greatly impaired hepatic function, the bile is white. The fluid may be sterile, but usually the culture is positive.

Stones in the cyst are relatively uncommon findings, being reported only in the cases of McWhorter (88), Winterstein (147), Sato (cited by Yotuyanagi, 151), Keeley (68), Serfas and Lyter (116), Caroli and Marcoulides (26) (second case), and Truka (132). Stones were found in the gallbladder in the cases of Paulino (99), Cinelli (29)(second case), Respall-Hidalgo (103), and Bengolea *et al.* (10).

Cirrhosis of the liver is proportional to the degree of obstruction and duration. Ascending cholangitis may reach the stage of suppuration. Ascites is found in some cases, being secondary to cirrhosis and perhaps to pressure of the cyst upon the portal vein, and in either case splenomegaly is prone to occur.

Malignant degeneration of the cyst took place in 3 cases (43, 60, 145), one of which contained stones (60). In Armanino's (3) case, a primary hepatic carcinoma coexisted. One case is reported by Dexter (35), in which multiple carcinomas of the intrahepatic and pancreatic ducts were associated with congenital cystic dilatation.

The second type (Fig. 8b), congenital diverticulum of the common bile duct, is very rare, although some of the cases reported are not adequately described to allow inclusion in this type. We found 3 authentic cases in the literature (41, 97, 34), and one of us (F.A.L.) witnessed the removal of a fourth one.[1] This type is characterized morphologically by a diverticulum which arises laterally from the wall of the common duct. The biliary tree may be normal or slightly dilated. In the case of Egry *et al.* (41), there was a pedicle 3 centimeters in length between the cyst and the choledochus. Greenish fluid was present, but no lumen was noted in the pedicle. The gallbladder was attached to the cyst in the case of Dennison (34). The inclusion of this case in this type would explain the fact that the patient recovered after partial extirpation of the cyst and cauterization of the remaining lining. The patient of Nitsche (97) recovered after complete extirpation of the cyst, ligation of the pedicle, and drainage of the common bile duct. This cyst measured 20 by 15 by 11 centimeters. In this type the weakness factor would be limited to one small area of the side of the wall. It is feasible that a transitory augmentation of the intraductal pressure would act as the obstructive factor. Egry *et al.* (41) found the pedicle completely obstructed in their case.

The third type (Fig. 8c) offers special peculiarities and the question remains as to whether or not it originates from the same etiological factors. The term choledochocele (from the Greek, Kele meaning hernia) was used for the first time by Wheeler (142) when commenting on a case reported in December, 1915, in the "Dublin Journal of Medical Sciences" with the title of "Unusual Case of Biliary Obstruction." Wheeler introduced the term in view of the analogy with congenital ureterocele. We were able to collect 4 cases of this type. Two of them did not get recognition in the literature as choledochal cysts because they were titled "Enterogenous Cyst of the Duodenum" (50), and "Cyst of the Ampulla of Vater" (20). The other 2 recent publications were entitled "Intraduodenal Choledochal Cyst" (116), and "Diverticulum of the Common Bile Duct" (1). These 4 cases are included in our analysis. The case reviewed by Wheeler (142) was analyzed by Shallow (117), and is not included in our analysis.

The lesion involves only the intraduodenal part of the common bile duct. It never reaches

[1]After completion of this manuscript, Richard B. Cattell operated upon a 23 year old white female who was submitted elsewhere in October, 1953 to a partial excision and drainage of what was labeled a "hepatic cyst." The cyst was between the right and left lobes of the liver with a pedicle originating from the right hepatic duct and contained 1,000 cubic centimeters of fluid. This case is not included in the review.

the size of the other two types because the duodenal symptoms bring the patient early to the attention of the surgeon. The case of Brooks and Weinstein (20) is a notable exception in that the cyst measured 8 by 12 by 15 centimeters. The pancreatic and common bile ducts empty into the cyst which opens in the duodenal lumen. The outstanding feature of the choledochocele is that its wall is lined with duodenal mucosa inside and outside. This finding makes perhaps questionable the choledochal paternity of this type. However, the little, if any, dilatation of the biliary tree above the cyst coincides with the other types. As far as etiology is concerned, the small opening into the duodenum may act as the obstructive factor. The weakness factor is represented by the "herniated" choledochus into the duodenum.

CLINICAL PATHOLOGY

The clinical picture of congenital choledochal cyst varies from almost complete absence of symptoms to the "in extremis" picture of a usually fatal bile peritonitis due to its rupture. This latter complication is illustrated by the case of Kong (72) of the Sun-Yat-Sen University where the diagnosis was made promptly, and the cyst and the abdomen were drained. The patient survived the operation. Further treatment was not given and follow-up study was not done. Infection and necrosis were responsible for the rupture in the cases of Tagart (128), Kong (72), Weber (140), in the sixth case of Walton (139), and in the case of Blegen and Boyer (13). Trauma was the cause of the rupture of Wright's first case (148) (fall from a bicycle), and in the case of Blocker *et al.* (14) it was a fall from a swing. A few symptomless cases are reported, but these were usually small segmented "enlargements" found at autopsy.

Pain, jaundice, and mass[2] have been considered the classical triad of this malady. The triad was present in 63 per cent of the 232 cases reviewed by Tsardakas and Robnett (133), but in just 21 per cent of our 94 newly analyzed cases. It is interesting to note through the literature that the more recent the review, the lower is the incidence of the triad. We believe this represents earlier recognition of the disease. Table IV shows the incidence of symptoms when specifically stated in the 94 newly analyzed cases.

The onset of intermittent jaundice and vague abdominal symptoms, such as mild indigestion, nausea, and upper abdominal discomfort, can many times be detected in early childhood. A mass may be present from time to time in the right upper quadrant. Typical attacks of cholecystitis or cholelithiasis are described. It is not unusual for the patient to be submitted to several disappointing operations. Appendectomies and cholecystectomies are often found in the past history. Some unfortunate patients reach a state of anorexia, vomiting, weakness, hemorrhagic tendencies, and malnutrition before the true pathology is recognized and adequate treatment carried out.

The pain is usually located in the right upper quadrant and may radiate toward the epigastrium, right lower quadrant, and back. It is vague and usually not severe. It is believed to be caused by distention of the wall of the cyst or partial obstruction of the common bile duct. Colicky pain may occur when the pressure of the cyst upon the distal common duct produces a complete obstruction. Episodes of an acute attack of pain and spontaneous relief may be explained by a probable valvelike mechanism in the distal portion of the cyst or duct.

Jaundice may be absent, slight, intermittent, or long-standing. The laboratory tests usually point toward the obstructive type, but if cirrhosis and cholangitis are present the parenchymatous component is strongly manifested. Acholic stools, dark urine, and pruritus may accompany the intense jaundice.

TABLE IV.—INCIDENCE OF SYMPTOMS IN 94 NEWLY ANALYZED CASES

	No. of cases	*Per cent*
Jaundice	69	73.40
Pain	61	64.89
Mass	56	59.57
Vomiting	35	37.23
Fever	32	34.04
Nausea	25	26.59
Dark urine	23	24.48
Clay-colored stool	22	23.40
Diarrhea	7	
Pruritis	5	
Ascitis	3	
Weight loss	3	
Flatulence	2	
Distention	2	
Chills	2	
Steatorrhea	2	
Others	11	

Under others we include the following symptoms which were reported once: amenorrhea, lethargy, headache, anemia, convulsions, dyspepsia, dystrophy, hepatosplenomegaly, petechia, fat intolerance, heart burn.

[2]We think that "mass," for its wider sense, covers the description of this sign better than the classically expressed "tumor."

A mass felt in the right upper quadrant, when cystic, is of great diagnostic significance. Typically, it is soft, elastic, round, regular, mobile laterally, and may follow the movements of the diaphragm. Usually it is not tender to palpation. Its size is not in relation to the symptoms. The liver may be difficult to differentiate from the cyst. When the cystic mass is small a sensation of resistance may be detected in the right upper quadrant. Variation in the size of the mass may occur. This feature when encountered in a young female is almost pathognomonic of congenital cystic dilatation of the common duct.

Vomiting may be present in infected cases and in cases in which the cyst causes obstruction because of compression of the duodenum against the anterior abdominal wall (our second case). According to Moseley (93), a "partial ileus" due to pressure of the cyst against the root of the mesentery would be responsible for the vomiting. Nausea and vomiting occur in cases of complete biliary obstruction, coinciding with the colicky pains. The presence of a large quantity of bile in the vomitus at the end of the attack was explained by Walton (139) by sudden liberation of the contents of the cyst into the duodenum.

Fever may be found in infected cases and is not unusual when the condition is associated with cholecystitis, hepatitis, or cholangitis.

In the 5 cases of choledochocele, nausea or vomiting, and pain were constantly reported. Jaundice was present in 3 of the 5 cases and a palpable mass was constantly absent.

INCIDENCE

The Japanese race seems to be particularly affected. About one-third of all of the cases reported in the world literature occurred in the Japanese race. It is interesting to point out that in the Asiatic races there is no significant preponderance in the female sex, in contradistinction to a definite predilection for this sex in the white race. Among our newly analyzed cases for which the sex is reported, 84 per cent were found in the female. Because of its congenital origin the disease is usually encountered in children and young adults, although the condition may be found at any age. In about 7 per cent of the cases the malady was detected during pregnancy. Of 92 of the cases analyzed here, in which the age of the patient was available, 18 per cent of the patients were less than one year of age, 45 per cent were less than 10 years, and 82 per cent were 30 years of age or less. About 83 per cent of the patients whose cases were reported in the world literature were 30 years of age or less.

DIAGNOSIS

Of utmost importance is the classic triad of pain, jaundice, and mass, and its intermittent appearance.

As pointed out by Gross (51), a study of the majority of the individual case reports gives the impression that the diagnosis could have been suspected if its possibility had been entertained.

Roentgenological studies may yield the correct diagnosis. Plain films of the abdomen and contrast studies of the gastrointestinal tract reveal a radiolucent mass displacing the structures from their normal position in the right upper quadrant. The normal kidney may be seen through the mass (Fig. 2) and intravenous pyelogram or contrast studies of this organ may be used if necessary to differentiate kidney masses. In cases of choledochocele a polyp of the second portion of the duodenum may be diagnosed on upper gastrointestinal contrast studies (1). Oral cholecystography seldom reveals the cystic dilatation due to its failure to concentrate the media. Moseley visualized the cystic dilatation by giving iodopanoic acid (0.30 gram) as contrast media in a child. Intravenous cholangiogram usually demonstrates the cyst when jaundice is not present (87, 99, 64, 47) (Fourth case). In cases of known intermittent jaundice, a delay until it subsides may allow a radiological diagnosis. When operation is required in an icteric patient an operative cholangiogram may be of great diagnostic value (70, 82, 133, 29, 150, 76) (second and third cases).

Aspiration of bile from the cyst could be considered pathognomonic if the gallbladder is eliminated. We consider hazardous the technique described by Lumpkin and Wilson (82), and by Kjellberg (70) of needle aspiration through the abdominal wall and injection of water miscible contrast media and air. Leakage and bile peritonitis could occur unpredictably.

In several instances the injection of radiopaque dye through a catheter placed in the cyst (Figs. 3 and 4) or through a "T" tube inserted into the common duct in previous operations yield the correct diagnosis.

The diagnosis of choledochal cyst is not usually made preoperatively. In the review by Judd and

Greene (62), of the first 64 cases reported in the literature, only the case of Neugebauer (96) in 1924, was diagnosed before operation. The percentage of correct preoperative diagnosis is increasing gradually. In the review by Shallow *et al.* (117), of 175 cases in 1943, the diagnosis was made, suspected, or included in the differential diagnosis in 22 cases, or 13 per cent. In the review by Tsardakas and Robnett (133), in 1956, 23 cases were correctly diagnosed preoperatively and in 13 more, choledochal cyst was suspected making a total of 36, or 16 per cent, in 232 cases. Of their 57 analyzed cases, the diagnosis was made or mentioned in 14, or 25 per cent of the cases.

In this analysis of 94 cases, the diagnosis of choledochal cyst was made solely in 11, in 17 more it was included in the differential diagnosis making a total of 28 cases, or 30 per cent. In 5 additional cases the diagnosis was made by injecting radiopaque dye through a catheter placed in the common duct at previous operation. This makes a grand total of 33 cases, or 35 per cent, in which congenital choledochal cyst was mentioned before definitive surgery was carried out. In 2 of Glove's (47) 5 cases the diagnosis was correctly made, in 2 others it was suspected, and in one the diagnosis was not given—a diagnostic accuracy of 80 per cent. Table V shows the preoperative diagnoses given in our 94 analyzed cases.

The number of diagnoses exceeds 94 because in many instances several diagnoses were contemplated. Included in the miscellaneous group were diagnoses mentioned only once as follows: intestinal tumor, sympathoma, stone of the common duct, ovarian tumor, kidney tumor, generalized peritonitis (ruptured cyst found), endocarditis, and obstructive jaundice without specification. The diagnoses of polyp of the second portion of the duodenum, intramural benign neoplasm in the same location, enterogenous cyst, and ectopic pancreas were given in cases of choledochocele.

TABLE V.—DIAGNOSIS GIVEN IN 94 NEWLY ANALYZED CASES OF CONGENITAL CHOLEDOCHAL CYST

Congenital choledochal cyst and synonyms	11
Choledochal cyst suspected or mentioned in the differential diagnosis	17
Diagnosis made by injection of dye through a drainage catheter inserted in previous operation	5
Cholecystitis, cholelithiasis, or choledocholithiasis	10
Pancreatic cyst, tumor, or abscess	9
Retroperitoneal cyst or tumor	6
Hepatic cyst or tumor	6
Hepatitis	5
Echinococcal cyst of liver	4
Congenital atresic bile ducts	4
Hydrops of enlarged gallbladder	3
Acute appendicitis	2
Acute and chronic pancreatitis	2
Mesenteric cyst	2
No diagnosis given	19
Miscellaneous	12

DIFFERENTIAL DIAGNOSIS

Conditions which should be included in the differential diagnosis are listed below and their salient features noted.

A. Hydatid cyst of the liver could give similar clinical signs; however, the symptoms are usually mild allergic reactions with little disturbance to the patient's health. The parasite is cosmopolitan, but the occurrence of the echinococcus in man has a definite geographical distribution. The areas in which it is mostly found are South America, Western Europe, Morocco, South Africa, Iceland, Australia, and New Zealand. Of more than 500 patients reported in the United States, 98 per cent were immigrants. The history of the disease may be long-standing in both illnesses, however, in echinococcus cyst the mass progresses in size in contrast to intermittent appearance of the cyst in congenital choledochal cyst. In hydatidosis intimate contact with dogs or cattle, detection of hydatid thrill, eosinophilia, precipitin reaction, the complement fixation test of Weinberg, and the intradermal reaction of Cassoni will give enough information to make a definite diagnosis.

B. The exclusion of cholelithiasis should not be difficult in a patient who gives a history dating from childhood. Roentgenologic studies may aid in determining the presence or absence of stones. The possibility of gallstones in a child resulting from a blood dyscrasia with an abnormal hemolytic process should be kept in mind.

C. Age and progressive jaundice differentiate congenital atresia from congenital cyst of the common duct.

D. Congenital cysts of the liver are small, multiple, and usually associated with cystic kidneys.

E. Wilms tumor and any other retroperitoneal neoplasms are known to be progressive toward a fatal outcome.

F. Carcinoma and sarcoma of the upper

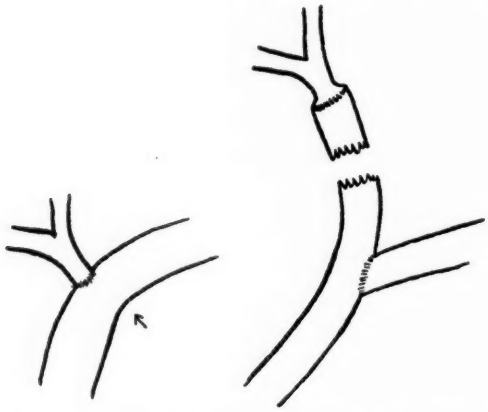

FIG. 9. Removal of the cystic dilatation. Left, Choledochoduodenostomy. Right, Choledochojejunostomy Roux-en-Y.

gastrointestinal tract and liver follow the same unfavorable course.

G. Carcinoma of the ampulla of Vater or head of the pancreas can cause jaundice and slight or no pain, but the history is relatively short and progressive.

H. The differential diagnosis between pancreatic cyst and choledochal cyst may be difficult to make preoperatively, but the location of the abdominal mass is usually more to the left in pancreatic cyst. The pancreatic cyst may displace the duodenum to the right and widen the "C" loop. The differentiation could be impossible in those cases of intramural choledochal cysts which develop into the head of the pancreas (second case of Rivarola, 105).

From the therapeutic point of view suspicion of the choledochal cyst preoperatively will allow prompt recognition upon laparotomy, avoiding unwarranted delays or, worse, useless procedures.

TREATMENT

There is considerable controversy regarding the treatment of congenital cystic dilatation of the common bile duct as is indicated by the multiplicity of surgical procedures advocated.

The sine qua non for adequate treatment is the recognition of the lesion at the operating table. In some cases lack of information concerning the entity or a relatively small cyst partially hidden in the retroperitoneal space are responsible for the perplexity of the surgeon facing this condition. Valuable time may be consumed searching unsuccessfully for the cause of the symptoms, with deterioration of the patient's general condition.

Among the many surgical procedures reported in the literature, the following deserve to be analyzed in this review: (a) complete removal of the cyst and anastomosis of the remaining biliary tree to the intestinal tract, (b) anastomosis of a portion of the intestinal tract to the cyst, (c) choledochorrhaphy, and (d) by-passing the cyst (Figs. 9, 10, 11).

Absence of surgical treatment implies an almost certain fatal outcome. Among the 232 cases reviewed by Tsardakas and Robnett (133), 30 patients were submitted to medical treatment and 29 died. The result in the remaining case is unknown. In the 94 cases analyzed by us, just one received medical treatment (64). The patient's condition was reported to improve, but no length of time was stated. The first case was successfully operated upon in 1894. Swain (126) performed a cholecystojejunostomy (loop type), by-passing the lesion.

We are of the opinion that removal of the cystic dilatation with reconstruction of the normal anatomy by anastomosis of the biliary tree to the second portion of the duodenum is the treatment of choice (Figure 9a). McWhorter (88) in 1922 was the first to carry out this procedure.

In cases of large cysts with the dilatation involving the distal hepatic ducts, it may not be advisable to do such an extensive mobilization of the duodenum. In these cases, anastomosis of the hepatic duct(s) to the jejunum with a loop of jejunum in a Braun jejunojejunostomy or an anastomosis Roux-en-Y may be preferred. To avoid the antiphysiological diversion of bile from the duodenum with possible ulcer formation (19), plastic operations creating a tubular flap from the antrum of the stomach to anastomose it to the remaining biliary tree may perhaps be used in the future. A gastrojejunostomy would complete the surgical procedure to avoid possible impaired pyloric function.

The objection to excision of the cyst in the past was the high mortality; 40 per cent in the Japanese literature (53), and 29.4 per cent (5 deaths in 17 cases) in the review of 232 cases by Tsardakas and Robnett (133). However, in our 94 newly analyzed cases there were 2 deaths in 13 cases, or a 15 per cent mortality. One fatal outcome occurred in a patient submitted to a very

extensive surgical procedure (second case of Rivarola, 105). Of the remaining 11 patients, 4 were followed up for 5 months, 8 months, one year, and 2 years, respectively, and all were reported asymptomatic. McWhorter (89) in 1935 performed an autopsy on his patient who had been subjected to excision of his cyst in 1922 and could not find clinical or histological evidence of cholangitis. Jones *et al.* (61) in their recent article pointed out that ascending cholangitis does not occur in absence of the sphincter mechanism when obstruction in the common bile duct is not present. Anastomosis of the remaining biliary tree with a Roux-en-Y jejunal loop of at least 30 centimeters would prevent the entrance of chyme into the bile duct. This was demonstrated experimentally by Pearse, Radokovich, and Cogdill (100), although Bowers, as stated previously, raised the question of duodenal ulcer formation.

Many authors are of the opinion that excision of the cyst is hazardous, especially in children. Bakes (7), in 1907, performed for the first time a side-to-side anastomosis of the cystic dilatation to the duodenum (Figure 10a). Gross (51) recommended this procedure. He pointed out that the size of the cyst diminishes when adequate drainage is established. Hertzler and Maguire (56) reported that the size of the cyst did not change 11 years after choledochocystoduodenostomy. The cyst, however, never disappears completely. A fluid level is often seen in the erect films. Infection and ascending cholangitis occur frequently, although the location of the anastomosis plays an important role. When it is performed in the most dependent portion of the cyst, adequate drainage is more likely to take place. In the Japanese cases anastomosing the cyst to either the stomach or duodenum carried a mortality of 26 per cent (53). The same mortality was reported by Tsardakas and Robnett (133) in 96 patients submitted to these procedures.

Our review of 98 cases (94 newly analyzed and 4 "follow-up" cases), reveals that choledochocystoduodenostomy was performed 44 times with 2 deaths. One patient died 5 days postoperatively apparently of an unrelated cause and the other, one year after operation, from progressive tuberculosis. Of 29 of the 42 survivors who were given follow-up examinations by the authors, 9 developed various degrees of ascending cholangitis, 2 had attacks of vomiting and pain, and 2 revealed that the anastomosis had closed. This gave a morbidity of 31 per cent.

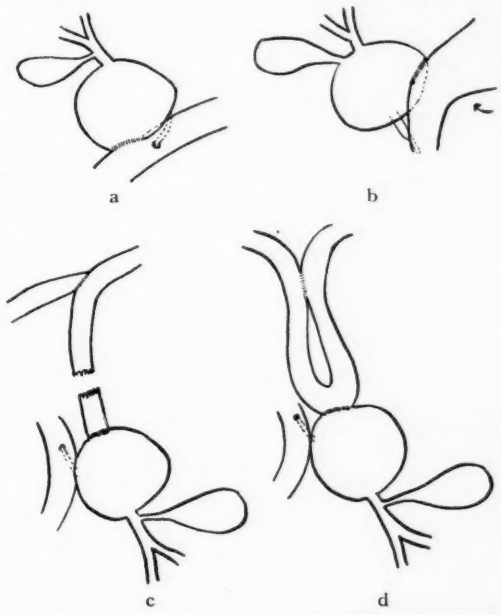

FIG. 10. a, Choledochocystoduodenostomy. b, Choledochocystogastrostomy. c, Choledochocystojejunostomy; loop type with Braun jejunojejunostomy. d, Choledochocystojejunostomy Roux-en-Y type.

Choledochocystogastrostomy in our review was performed 8 times with 3 deaths, a mortality of 38 per cent. In 3 cases in which follow-up study was made, 2, 6, and 18 months postoperatively no morbidity is reported.

The Archambaults and Lasker (2) advocated choledochocystojejunostomy in the Roux-en-Y manner to avoid severe ascending cholangitis. This procedure was used originally by the Japanese authors, Tsujimura (134), in 1927 for the first time, and by Kambe (63) and Fujihara (45), a few years later. It was introduced into this country in 1948 by Keeley (68). Keeley's patient was asymptomatic 11 years later (discussion of Glove's [47] paper by Keeley). Michel (90) considered that a choledochojejunostomy with a Braun jejunojejunostomy is less dangerous than a Roux-en-Y type and is just as adequate as far as avoiding reflux in the biliary tree is concerned. In his case, he was unable to force barium into the cyst even by pressure from the outside.

Hatano and Imato (53) report a mortality of 54

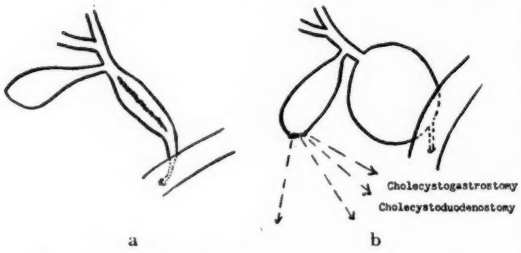

FIG. 11. a, Choledochorrhaphy, partial excision of the "cyst" with attempt at reconstruction of the choledochus. b, By-pass of the cystic dilatation.

per cent of their Japanese patients treated by a Roux-en-Y anastomosis with the cyst. The 5 patients subjected to the same procedure by Tsardakas and Robnett (133) recovered.

Choledochocystojejunostomy of either type was performed 17 times among the 98 patients analyzed here; 2 fatalities occurred. One patient died 4 months later because of gangrenous appendicitis and the other 18 months later because of widespread adenocarcinoma. Of 10 of the 15 remaining patients of whom follow-up was possible for variable periods of time, 2 developed complications, the anastomosis closed in one and the other developed diarrhea and steatorrhea.

When the patients are poor risks or when the condition of the patient deteriorates seriously on the operating table, it may be necessary to do some external drainage procedure through the cyst, gallbladder, or choledochus. Later, at a second stage, a biliary intestinal anastomosis is established.

Although choledochocystoduodenostomy and choledochocystojejunostomy are technically more simple than removal of the cyst and anastomosis of the remaining biliary tree to the intestine, the pathological dilatation is left in the patient, which may at a later date give rise to complications. Also, the absence of epithelial lining in the cyst may be the cause of failure when it is anastomosed to the gastrointestinal tract as pointed out by Glove (47). In the 94 cases analyzed in this review, the anastomosis closed in 4 cases. Browne (21) re-established continuity after a choledochocystoduodenostomy became obliterated by means of a cholecystogastrostomy. Glove (47), in his second case, performed a choledochocystojejunostomy (loop type) with a Braun anastomosis after a choledochocystoduodenostomy closed. In his third case, the anastomosis of the cyst to a jejunal loop with a jejunojejunostomy failed to maintain patency. A second operation of the Roux-en-Y type was necessary. In our second case we had a unique opportunity to confirm a completely occluded anastomosis between the cyst and the duodenum. The silk sutures showed that the stoma was 6 centimeters in length, which is considered adequate by the authors who advocate this procedure. We removed the cyst, which included the gallbladder, and anastomosed the remaining hepatic duct to the duodenum.

Choledochorrhaphy (Figure 11a), which consists of partial excision of the cyst in its longitudinal axis and attempted reconstruction of the normal diameter of the choledochus, does not correct the etiological factors and its use is condemned.

A by-pass procedure using the gallbladder when it is uninvolved (Figure 11b) may be the only reasonable choice when there are dense adhesions following several previous operations. The mortality is low, in that no deaths were reported in the review by Tsardakas (133) nor among the 4 cases submitted to this procedure in our analysis. However, one patient developed ascending cholangitis.

In the second type (congenital diverticulum of the common bile duct), removal of the diverticulum is unquestionably the treatment of choice. Because of its position, the continuity of the biliary tree is not interrupted.

In choledochocele incision of the cyst allows normal passage of bile into the duodenum. Excision of the cyst returns the anatomy of the biliary tree to normal and also corrects the impairment of duodenal function.

In short, surgery offers the only hope. Removal of the cyst with hepatoduodenostomy or choledochoduodenostomy restores the normal anatomy. Its preference may be disputed by those who favor removal of the cyst followed by hepatojejunostomy or choledochojejunostomy. In our opinion these procedures represent the best guarantee for a definitive cure. This is true particularly when the cyst is large or infected and its presence harbors future danger of stagnation and ascending cholangitis. It is understood that these procedures are quite extensive and the patient should be in a relatively good condition. The surgeon must also be familiar with the surgery of the biliary tree. Otherwise, choledochocystojejunostomy has been

TABLE VI.—ANALYSIS OF 94 CASES.

Case number	Authors and references	Year of publication Age of patient Sex of patient	Symptoms: Classical triad (Pain, Jaundice, Mass)	Symptoms: Others	Preoperative diagnosis	Operations	Follow-up
	(62) Judd and Greene*	1928 13 y. F.	P J M		Cholecystic disease	Cystoduodenostomy	Biliary symptoms 18 yrs. later (119)
309	(85) Masciottra and Varela Chilese (1st case)	1934 20 y. F.	P J M	Vomiting, fever	None given Injection of dye through catheter yielded the diagnosis	1. Cholecystotomy and drainage tube (elsewhere) 2. Choledochocystoduodenostomy	Death 5th postoperative day (from unrelated cause) (141)
310	(97) Nitsche	1942 50 y. F.	P - M	Vomiting, nausea	Mesenteric cyst	Extirpation of cyst, drainage of choledochus	Fistula for 29 days, followed by recovery
311	(20) Brooks & Weinstein	1943 30 y. M.	P J -	Nausea, vomiting, dark urine	Acute cholecystitis No diagnosis given	1. Cholecystotomy and drainage of gallbladder 2. Excision of cyst, reconstruction of ampulla of Vater	Patient well 1 yr. later
312	(29) Cinelli (1st case)	1944 58 y. F.	- J M	Dk. urine, nausea, fever	Neoplasm of biliary tree Operative cholangiogram yielded correct diagnosis	Choledochocystoduodenostomy	Death 1 yr. postoperative from progressive consumption (relative informed)
313	(29) Cinelli 2nd case	1944 60 y. F.	P J -	Acholic stool, dark urine, pruritus	Pancreatitis with obstruction of common bile duct Neoplasm of duct. Operative cholangiogram yielded correct diagnosis	Impossible to dissect the "cyst." Cholecystostomy, removal of stones, and cholecystogastrostomy performed	Recovery
	(58) Hutchins and Mansdorfer*	1944 6 y. F.	P - M	Vomiting, intermittent size of mass, leucocytosis	Neuroblastoma	1. Drainage of gallbladder 2. Choledochocystoduodenostomy (42 days later)	Pneumonia Postoperative pneumonia. Jaundice 1 yr after 2nd operation. (Cholecystography was suggestive of stones in gallbladder). "Acute gallbladder" in 1956
314	(43) Ferraris, Navarro, and Escargel	1944	P J M	Acholic stool, dark urine, pruritus	Neoplasm of liver or biliary tree	Drainage of "cyst"	Death. Autopsy showed adenocarcinoma inside cyst

*Not included because analyzed in previous review. For follow-up only.
**Operation by Harold H. Burns.

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication Age of patient Sex of patient	Symptoms: Classical triad: Pain Jaundice Mass	Symptoms: Others	Preoperative diagnosis	Operations	Follow-up
315	(123) Stajano	1946 25 y. F.	P - M	Nausea, vomiting	Hydatid cyst	1. Biopsy, drainage	
						2. 14 days later, partial excision of cyst, choledochorrhaphy, cholecystectomy, choledochogastrostomy	Recovery. Patient well 2 months after operation
316	(103) Respall Hidalgo	1948 21 y. F.	P J -	Nausea	Acute cholecystitis	1. Partial cholecystectomy, cauterization of remnant gallbladder. Exploration of common bile duct and insertion of "T" tube.	Patient was not followed up
					Diagnosis made postoperatively by injection of dye through "T" tube	2. Patient refused new operation	
317	(55) Hepp and Cachin	1948 62 y. M.	- J M	Vomiting, nausea	Gallbladder tumor	Partial resection, choledochorrhaphy, choledochoduodenostomy, cholecystostomy, gastroenterostomy	Violent agitation for 3 days. Recovery
	(24) Cachin (follow-up of previous case)*	1949					Doing well. Gastrointestinal examination showed reflux of barium in choledochus
318	(15) Blummelkamp and Verboon	1948 4 dys. F.	- - M	Vomiting	Pancreatic or retroperitoneal cyst	1. Cystostomy, gastrostomy (replacing bile from cyst through gastrostomy)	
						2. Cystogastrostomy (4 mos. later)	Doing well 18 months later
	(68) Keeley*	1948 30 y. M.	P J -		Cholecystitis	Choledochocystojejunostomy, Roux-en-Y	Asymptomatic 11 years postoperative (47)
	(106) Rogers and Priestley*	1949 62 y. F.	P J M		Cancer of pancreas, cholecystitis	Cystojejunostomy, Roux-en-Y Drainage of cyst	Death 4 months later during operation for gangrenous appendicitis (117)
319	(50) Gordimer and Bluestone	1950 30 y. F.	P - -	Nausea, vomiting, fever	Acute appendicitis	Excision of cyst, insertion of "T" tube in common bile duct	Recovery
320	(136) Flachsland and Varela Chilese	1950 16 y. F.	P J -	Pruritus	Choledocholithiasis	Exploratory laparotomy (elsewhere), partial excision of cyst, choledochoduodenostomy	6 year postop. asymptomatic (delivered 2 yrs. postoperatively)
321	(27) Carter and Saypol	1950 3 m. F.	- J -	Clay-colored stool, dark urine	Congenital atresia of the bile duct	Cholecystogastrostomy	Recovery

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication / Age of patient / Sex of patient	Symptoms: Classical triad: Pain	Jaundice	Mass	Others	Preoperative diagnosis	Operations	Follow-up
322	(66, 67) Kazar	1950 ?	P	J	-		Choledochal cyst by cholangiogram	Choledochocystoduodenostomy	Recovery
323	(91) Militarey	1950 33 y. M.	P	J	M	Fever, acholic stool, dark urine	Infectious hepatitis, abscess of liver	Choledochocystoduodenostomy	Recovery
324	(143) White	1951 18 m. M.	-	-	M		Suspected congenital cystic dilatation of the common bile duct	Choledochocystoduodenostomy	Immediate postoperative cholangitis. Recovery
325	(6) Atumi	1951 22 y. M.	P	J	-		Cholelithiasis	Choledochocystoduodenostomy	Recovery
326	(111) Schena	1951 25 y. F.	P	J	-	Nausea, vomiting	None given	Cholecystectomy, choledochoduodenostomy, jejunostomy (to protect anastomosis of biliary tree and gastrointestinal tract)	No follow-up. (Doubtful case, see above.)
327	(18) Böttger	1951 1 m. F.	-	J	M	Vomiting	Puncture of abdominal wall and bile obtained, diagnosis of malformation of bile duct made	Resection of part of cyst, choledochorrhaphy, and choledochogastrostomy	Death 48 hours postoperatively from peritonitis. Autopsy showed open ductus botalli. Agenesis of rt. kidney
328	(67) Kazar and Takacs	1951 ?				No symptoms			Postmortem finding
329	(50) Goldman and Zack	1952 37 y. F.	P	J	-	Vomiting, headache, flatulence	Chronic cholecystitis	Cholecystectomy, choledochocystoduodenostomy	Patient well 18 months after operation
330	(12) Bernheim, Marion, Roux, Lanternier, and Bethenod	1953 6 m. F.	-	J	M		Atresia of bile duct	1. Choledochocystogastrostomy 2. Gastrojejunostomy due to pyloric stenosis (1 month after 1st operation)	Death Autopsy showed choledochal cyst and atresia of bile duct
331	(16) Bodart, Neimann, Lesure, and Pierson	1953 3 y. F.	-	J	M	Diarrhea, clay-colored stool, dark urine	Hepatic or intestinal tumor	1. Diagnoses at operation —cyst of cystic duct; common bile duct ligated, cyst removed 2. Error found, choledochojejunostomy with Braun anastomosis	Recovery, no follow-up
332	(132) Truka	1953 22 y. F.	P	J	M		Cholelithiasis and hepatitis	Cholecystoduodenostomy	3 yrs. asymptomatic

*Not included because analyzed in previous review. For follow-up only.
**Operation by Harold H. Burns.

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication Age of patient Sex of patient	Symptoms: Classical triad (Pain, Jaundice, Mass)	Symptoms: Others	Preoperative diagnosis	Operations	Follow-up
333	(81) Louw	1953 9 y. F.	P - M	Fever, anemia	None given	Choledochocystojejunostomy, Roux-en-Y	Recovery, no follow-up
334	(149) Wrightson	1953 5 wk.	- - M		Congenital cystic, dilatation of common bile duct (by aspiration of bile through cannula)	Choledochocystoduodenostomy	1 yr. after operation, occasional vomiting
335	(23) Burgess and Cherry	1953 14 y. M.	P J M		Infectious hepatitis, choledochal cyst, primary hepatoma	Choledochocystoduodenostomy	2 yrs. after operation, mild attacks of cholangitis
336	(26) Caroli and Marcoulides 1st Case	1953 11 y. ?	P J M	Clay-colored stool, dark urine, vomiting, pruritus	Pancreatic cyst with compression of common bile duct	1. Drainage of bile duct (Kehr's drain) 2. Hepatoduodenostomy (by-passing cyst) 3. Hepatojejunostomy Roux-en-Y (because of jaundice)	2 yrs. after operation volume of cyst ¼ of original fistula between cyst and hepatojejunostomy
337	(26) 2nd Case	1953 34 y. F.	P J -	Fever	Choledocholithiasis	1. Cholecystostomy, exploration of common duct 2. Choledochoduodenostomy 3. Cholecystectomy	Ascending cholangitis (controlled by antibiotics)
338	(26) 3rd Case	1953 20 y. F.	P J -	Nausea, clay-colored stool, dark urine	None given	Cholecystectomy, choledochostomy, removal of pancreatic stone	Recovery, no follow-up
339	(26) 4th Case	1953 59 y. F.	P J -	Fever, chills	None given	Cholecystectomy, choledochoduodenostomy, gastrojejunostomy	Patient had cholangitis 13 months after operation followed by recovery
340	(26) 5th Case	1953 48 y. ?	P J -		None given	Drainage of cyst	Improvement
341	(125) Sulamaa 1st case	1953 4 y. F.	- J M	Fever	None given	Choledochocystoduodenostomy	Wound infection, no symptoms 1 year after operation
342	(125) 2nd case	1953 4 m. F.	- J -	Clay-colored stool, dark urine	None given	Choledochocystoduodenostomy	Asymptomatic after 1 month
343	(28) Caussade, Bodart, Neimann, Lesure, and Pierson	1954 21 d. F.	- J M	Dark urine	Atresia of bile duct or choledochal cyst	Choledochoduodenostomy	Atelectasis and paralytic ileum after operation. Recovery

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication Age of patient Sex of patient	Symptoms: Classical triad (Pain, Jaundice, Mass)	Symptoms: Others	Preoperative diagnosis	Operations	Follow-up
344	(34) Dennison	1954 5 y. M.	- J M		Retroperitoneal cyst or tumor	Partial excision of cyst, remainder attached to liver, lining swabbed with pure carbolic acid and spirit.	Patient well 5 months after operation
345	(131) Tortorici	1954 27 y. M.	P J -		Obstructive jaundice	Choledochocystoduodenostomy	Recovery
346	(53) Hatano and Imoto	1954 24 y. F.	P J -	Temperature 104 degrees	Suspected choledochal cyst	Choledochocystoduodenostomy	Patient well 3 yrs. after operation
347	(65) Kaplan, Barcat, Grumbach, Ducas, and Guignard	1954 5 m. F.	- J M	Vomiting	Retroperitoneal tumor, sympathoma	1. Excision of cyst, hepatoduodenostomy 2. Anastomosis of fistula to second portion of duodenum (1 week later)	Recovery
348	(32) Delannoy and Lagache	1954 31 y. F.	P J M	Fever	Carcinoma of head of pancreas	1. Biopsy of cyst, creation of external fistula 2. Cholecystoduodenostomy (10 months later)	Intermittent nausea, pain, and light jaundice
349	(5) Attar and Obeid (1st case)	1955 18 y. F.	P J M	Vomiting, fever	Hydatid cyst of liver	Choledochocystojejunostomy, Roux-en-Y	Asymptomatic 2½ years after operation
350	(5) 2nd Case	1955 14 y. F.	P - M	Fever	Hydatid cyst of liver	1. Marsupialization of cyst (thinking in terms of hydatid cyst) 2. Nature of cyst recognized and choledochojejunostomy Roux-en-Y performed	Asymptomatic 2½ months after operation
351	(82) Lumpkin and Wilson	1955 10 m. M.	P - M	Diarrhea, vomiting, Fever 102 degrees	Choledochal cyst	Choledochocystoduodenostomy	Patient well 15 months after operation
352	(21) Browne	1955 27 y. F.	- J M	Clay-colored stool, dark urine, amenorrhea, weight loss	Obstructive jaundice due to choledochal, pancreatic, or mesenteric cyst	1. Choledochocystoduodenostomy, cholecystostomy 2. Cholecystoantrostomy (45 days later)	Nonfunctioning anastomosis after 1st operation. Recovery after 2nd operation. No follow-up
353	(119) Shocket, Hallenbeck and Hayles (1st case)	1955 2 y. F.	- - M	Dark urine	Retroperitoneal or hepatic tumor	Cystoduodenostomy	No follow-up given
354	(119) 2nd Case	1955 10 y. ?	P J M	Nausea, vomiting, fever	Pancreatic cyst, choledochal cyst suspected	Cystojejunostomy, Roux-en-Y	No follow-up given

*Not included because analyzed in previous review. For follow-up only.
**Operation by Harold H. Burns.

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication Age of patient Sex of patient	Symptoms: Classical triad (Pain, Jaundice, Mass)	Symptoms: Others	Preoperative diagnosis	Operations	Follow-up
355	(119) 3rd Case (5th of their Mayo Cl. review)	1955 4 y. F.	P J M		Stone of common duct, hepatitis, congenital band or cyst	Cystoduodenostomy	Recovery. No follow-up given
356	(153) Zimmermann	1955 2½ y. F.	P - M	Dystrophy	None given	Exploratory laparotomy. Findings: exudative peritonitis (E. coli) Choledochal cyst left untreated	Death 1 day after operation. Autopsy findings—choledochal cyst, biliary cirrhosis, peritonitis, bronchopneumonia
357	(31) Curti, Fauze, and Verginelli	1955 9 y. F.	P - M	Weight loss, diarrhea, ascites	None given. Bile peritonitis following needle liver biopsy	Drainage of peritoneal cavity	Death 1 day after operation
358	(98) Paul	1955 12 y. F.	P J -	Vomiting, dark urine, nausea, steatorrhea	None given	Cystoduodenostomy	Patient well 2 years after operation
359	(64) Kanoni	1955 20 y. F.		Heart burn after meals	Diagnosis of choledochal cyst made by I.V. cholangiogram	Author did not believe that surgery could improve the condition (!) Medical treatment given	Improvement. No length of time given
360	(83) Ma-An-Chuen and Kiang Yu 1st Case	1955 7 m. M.	- - M	Vomiting, fever	Wilm's tumor	Choledochogastrostomy	Recovery
361	(83) 2nd Case	1955 7 m. M.	- - M	Fever	Wilm's tumor	Choledochogastrostomy	Death
362	(83) 3rd Case	1955 20 m. M.	- J M		Choledochal cyst suspected	Choledochogastrostomy	Patient well 6 months after operation
363	(78) Latallo and Radlowska	1955 2 y. F.	P J -	Clay-colored stool, dark urine	Hepatitis	Choledochoduodenostomy	Patient well 5 weeks after operation
364	(33) Demolder	1955 19 m. F.	P - M	Fever	Hydrops, tumor of kidney, liver, or ovary	Excision of cyst, choledochoduodenostomy, cholecystectomy	Recovery, no follow-up
365	(110) Saltz and Glaser	1956 2½ y. F.	- J -	Clay-colored stool, dark urine, fever	Choledochal cyst	Cystoduodenostomy	Patient well 3 months after operation
366	(145) Wilson, Morrissey, and McConnell	1956 33 y. F.	P J M	Nausea	None given	1. Partial excision of the cyst, cystojejunostomy Roux-en-Y 2. Exploratory laparotomy (18 months later) widespread adenocarcinoma invading liver	Death

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication Age of patient Sex of patient	Symptoms: Classical triad (Pain / Jaundice / Mass)	Symptoms: Others	Preoperative diagnosis	Operations	Follow-up
367	(25) Cantey	1956 3 y. F.	P J M	Diarrhea, vomiting	Retroperitoneal tumor	Hepatoduodenostomy	Recovery, no follow-up
368	(99) Paulino	1956 22 y. F.	P - -	Nausea	Diagnosis of choledochal cyst made by I.V. cholangiogram	Cholecystectomy (stones found), cystojejunostomy Roux-en-Y, with partial closure of the jejunal loop between cyst and jejunostomy (to avoid reflux)	Patient well 8 months after operation
369	(59) Ingelraus, Lacheretz, and Toison	1956 6 m. F.	- J M	Clay-colored stool, dark urine	Choledochal cyst	Choledochojejunostomy Roux-en-Y	No follow-up given
370	(152) Zehnder	1956 29 y. F.	P J -	Fever 102 degrees	Retrocecal appendicitis	1. Appendectomy 2. Choledochocystoduodenostomy	Ascending cholangitis 1 year after operation
371	(9) Barbosa and Rate	1956 2½ y. F.	P - M	Fever, nausea	None given	Excision of cyst, hepatoduodenostomy	Recovery
372	(105) Rivarola 1st case	1956 2½ m. M.	- J M	Vomiting, fever, dark urine, acholic stool	Congenital choledochal cyst	Hepatoduodenostomy	Patient well after 2 years
373	(105) 2nd Case	1956 1½ y. ?	- J M	Convulsions, ascites, fever	Tumor head of the pancreas	Excision of cyst, cystic duct, gallbladder, and portion of duodenum (injured during dissection). Gastrojejunostomy, hepatojejunostomy, pancreatoduodenostomy	Death 7 hours after operation
374	(120) Skapinker	1956 39 y. F.	P J M		None given	Cystojejunostomy Roux-en-Y	None given
375	(95) Negri and Flachsland; also reported by Varela Chilese 3rd case (136)	1956 30 y. F.	P J -	Dyspepsia	None given. Diagnosis made (after first operation) by injection of dye through drainage tube	1. Cholecystostomy and external drainage (elsewhere) 2. Choledochocystoduodenostomy	Patient well 6 months after 2nd operation
376	(87) McKirdie	1956 9 y. F.	P J -	Nausea, vomiting, fever, light stool, dark urine	Choledochal cyst suspected by I.V. cholangiogram	Cystojejunostomy (retrocolic) Roux-en-Y, cholecystectomy appendectomy	Patient well 1 year after operation

*Not included because analyzed in previous review. For follow-up only.
**Operation by Harold H. Burns.

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication Age of patient Sex of patient	Symptoms: Classical triad (Pain, Jaundice, Mass)	Symptoms: Others	Preoperative diagnosis	Operations	Follow-up
377	(150) Yap, Sabas, and Estaniel	1956 15 y. F.	P - M	Nausea, vomiting	Pancreatic cyst. Diagnosis of choledochal cyst made by operative cholangiogram	Choledochocystoduodenostomy	Patient well 1 year after operation
378	(128) Tagart	1956 15 y. F.	P J -	Diarrhea, acholic stool	Generalized peritonitis of unknown origin	1. Exploratory laparotomy. Deeply bile stained fluid in peritoneal cavity. No perforation found. Drain in foramen of Winslow left. 2. Common duct explored. "T" tube left in place	Death 9 days after operation. Rupture of choledochal cyst found with biliary peritonitis and hemorrhage from portal vein
379	(94) Murashow (1st case)	1956 12 y. F.	P J -	Fever, ascites, clay-colored stool	Liver abscess endocarditis	Choledochocystoduodenostomy	Recovery
380	(94) 2nd Case	1956 7 m. F.	- J -	Clay-colored stool, dark urine, hepatosplenomegaly, petechia	Atresia bile duct	Marsupialization of cyst to skin	Patient died 24 hours after operation
381	(94) 3rd Case	1956 6 y. F.	P J M	Clay-colored stool, lethargy	Choledochal cyst suspected	Cholecystectomy, choledochocystoduodenostomy	Recovery
382	(57) Horne (1st case)	1957 4½ y. F.	- - M		None given	Excision of cyst, hepatogastrostomy	Death when abdomen was being closed
383	(57) 2nd Case	1957 10 m. F.	P J -	Vomiting, clay-colored stool, dark urine	Retroperitoneal cystic teratoma, choledochal cyst	Choledochocystoduodenostomy	Patient well 6 months after operation
384	(57) 3rd Case	1957 14 m. F.	- J M	Diarrhea, fever	None given	Choledochocystoduodenostomy	Patient well 4 months after operation
385	(1) Alden and Sterner	1957 18 y. F.	P - -	Nausea	Polyp second portion of duodenum	Duodenostomy, incision of cyst through duodenal mucosa	Recovery
386	(104) Rheinlander and Bowens	1957 57 y. F.	- J -	Nausea, vomiting, chills, epigastric fullness	None given	1. Drainage, thinking in terms of gallbladder (elsewhere) 2. Exploratory laparotomy. Nothing done except control of hemorrhage (elsewhere 4 years later) 3. Left hemicolectomy for adenocarcinoma (1 yr. later) 4. Choledochojejunostomy, Roux-en-Y 11 dys. later	Patient well 2 yrs. after last opera.

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication Age of patient Sex of patient	Symptoms: Classical triad: Pain	Jaundice	Mass	Others	Preoperative diagnosis	Operations	Follow-up
387	(116) Serfas and Lyter	1957 43 y. F.	P	J	-	Nausea, vomiting	Cholelithiasis Intramural benign neoplasm of 2nd portion of duodenum. Enterogenous cyst. Ectopic pancreas	1. Cholecystectomy (stones found). Exploration of common duct 2. (6 months later) Excision of cyst, Oddi's sphincter, and ampulla through duodenostomy (stones found in cyst)	Recovery
388	(11) Berger and Juglair	1957 14 y. F.	P	J	M	Fever, vomiting	Hydrops, choledochal cyst, abscess of pancreas	1. External drainage 2. Anastomosis of biliary tree and gastrointestinal tract was going to be attempted	Death at the induction of anesthetic
389	(93) Moseley	1957 5 y. F.	P	J	M	Nausea, vomiting	Diagnosis of choledochal cyst made by oral telepaque	1. Normal appendix removed (elsewhere) 2. Cystoduodenostomy	Recovery
390	(69) Keith, Rini, and Martin (1st case)	1957 43 y. F.	P	-	-	Nausea, vomiting, flatulence, dark urine, light stool	Biliary lithiasis	Cholecystectomy, cystoduodenostomy	Patient well 9 months after operation
391	(69) 2nd Case	1957 41 y. F.	P	-	-	Nausea, vomiting, fever, weight loss	Acute cholecystitis Correct diagnosis made through "T" tube	1. Cholecystostomy, biopsy of cyst and gallbladder. "T" tube left in common duct 2. Cholecystectomy, cystoduodenostomy	None given
392	(41) Egry, Epstein, and Killner	1957 56 y. F.	P	-	M	Distention	Gallbladder tumor	Simple removal of cyst	Recovery
393	(129) Taylor and Slaney	1957 19 y. F.	-	J	M	Diarrhea, steatorrhea	Choledochal cyst	Cystojejunostomy Roux-en-Y	Diarrhea, (35% of ingested fat). Patient refused further surgery
394	(35) Dexter	1957 22 y. F.	-	J	-			Autopsy findings. Choledochal cyst. Bile duct carcinoma (multifocal) small pancreatic ducts carcinoma	Death
395	(47) Glove (1st case)	1957 36 y. F.	P	-	M	Nausea, vomiting, fever	Choledochal cyst	Cystojejunostomy (loop with Braun anastomosis)	Patient well 10 days after operation
396	(47) 2nd Case	1957 8 y. F.	P	J	M	Vomiting	None given	1. Choledochocystoduodenostomy 2. Choledochocystojejunostomy (loop with Braun anastomosis)	Chills, fever, intermittent jaundice. Recovery after 2nd operation

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**Operation by Harold H. Burns.

TABLE VI.—ANALYSIS OF 94 CASES.—Continued

Case number	Authors and references	Year of publication / Age of patient / Sex of patient	Symptoms: Classical triad: Pain	Jaundice	Mass	Others	Preoperative diagnosis	Operations	Follow-up
397	(47) 3rd case	1957 7 m. F.	-	J	M		Choledochal cyst	1. Choledochocystojejunostomy (loop with Braun anastomosis)	Asymptomatic for 2 years, then chills, fever, jaundice, acholic stool
								2. Choledochocystojejunostomy Roux-en-Y	Recovery after 2nd operation
398	(47) 4th case	1957 9 y. F.	P	J	M	Fever, nausea, vomiting	Cyst demonstrated by cholangiogram	Choledochocystojejunostomy Roux-en-Y	Asymptomatic 1 year after operation
399	(47) 5th case	1957 12 y. F.	-	J	M		Choledochal cyst suspected	Choledochocystojejunostomy Roux-en-Y	Asymptomatic 8 months after operation
400	(76) Lamy, Aussannaire, Jammet, Sauvegrain, Pellerin, Nezelof, Bader, and Pernot	1957 2 y. F.	P	J	-	Vomiting, clay-colored stool	Chronic pancreatitis. Operative cholangiogram yielded the correct diagnosis	Choledochoduodenostomy —"cyst" interested the entire extrahepatic biliary tree	None given
401	Authors' Cases 1st Case**	20 y.	P	J	-	Nausea, fatty intolerance, Light-colored stool, dark urine	Cholecystitis, cholelithiasis, possible choledocholithiasis	1. Normal appendix removed (elsewhere)	Asymptomatic 7 years after operation except for one episode (1957) of R.U.Q. pain and vomiting
	2nd Case	18 y.	P	J	M	Vomiting, fever, pruritus	Pancreatic, choledochal or hydatid cyst	1. Choledochocystoduodenostomy, drainage of cyst 2. Excision of cyst (including gallbladder and cystic dilatation) Anastomosis of hepatic duct to the duodenum Appendectomy	Patient asymptomatic and working 8 months after 2nd operation

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proved safe enough to deserve consideration. Choledochocystoduodenostomy is rapid and simple, but does not protect the patient from ascending cholangitis. These procedures can be used first and the cyst removed when its size has diminished and dissection is easier.

PROGNOSIS

In 1927, Lange (77) reviewed 53 cases with 9 recoveries following surgical intervention (83 per cent mortality). Seneque and Tailhefer (115) in 1929 reported a series of 82 cases with 29 recoveries (65 per cent mortality). In 1943 Shallow *et al.* (117) reported an operative mortality of 51 per cent among 148 surgically treated cases, and the recent analysis of Tsardakas and Robnett (133) showed a mortality of 23 per cent among 52 such cases. Our most recent analysis of 91 surgically treated cases shows a mortality of 12 per cent. This figure is lowered

to an operative mortality of 9 per cent for 88 operations if we exclude (1) a patient who died at the induction of anesthesia (11), (2) a fatality due to an unrelated cause 5 days postoperatively (136) and (3) a patient who died one year after the operation. Of the remaining 8 deaths, 4 were due to other pathology associated with choledochal cyst, and one each was due to ruptured cystic dilatation (128), biliary atresia (12), adenocarcinoma inside the cyst (43), and open ductus botalli together with agenesis of the right kidney (18), respectively. From these figures, it can be seen that with each subsequent review of the literature there is a sharp decrease in the mortality.

Some of the reasons for the lowered mortality are: better over-all surgical management, careful preoperative preparation, improved anesthesia, knowledge of electrolyte balance, blood transfusions, and antibiotics.

We were impressed by the frequently reported stormy postoperative courses, which we were able to confirm in our cases. The disturbances consisted of elevated temperature, intense jaundice, rapid pulse, and a state of impending shock. They were most marked when the cyst was removed. We believe that operative trauma and edema at the anastomosis were responsible.

The relatively few long term follow-up reports do not allow a statistically significant evaluation of the morbidity associated with the different operative procedures. At the present time removal of the cyst with anastomosis of the remaining duct to the duodenum or jejunum carries a slightly higher mortality, but a lower morbidity. Anastomosis of the cyst to the duodenum or jejunum has a lower mortality, but a higher morbidity. Ascending cholangitis is more prone to occur in the former than in the latter. Perhaps future reviews, with longer follow-up studies, will reveal a statistically significant number of cases to show conclusively the merit of one procedure over the others.

SUMMARY

Four hundred and three authentic, and 16 doubtful, cases of congenital choledochal cyst are collected from the world literature. Ninety-four are newly analyzed and 2 new cases are reported.

The disease is congenital in origin. The etiology consists of a weakness in a specific portion of the common bile duct caused by hyperproliferation and hypervacuolization of that area during embryonic development. Such a weakness constitutes a protodilatation status which develops into the clinical pathological entity when the ductal pressure increases because of an obstructive factor.

A classification is presented showing the three types: cystic dilatation, diverticulum, and choledochocele.

Pain, jaundice, and mass are the classic diagnosis triad. Intermittence of these symptoms increases the probability of congenital cystic dilatation. Jaundice is absent in the diverticular type. In choledochocele a mass is absent, but nausea or vomiting are always present.

The Japanese race and the female sex seem to be affected particularly. Eighty-two per cent of these patients are less than 30 years of age.

The differential diagnosis is discussed.

Removal of the cyst with anastomosis of the remaining biliary tree to the duodenum or jejunum is considered by the authors the treatment of choice. Choledochocystojejunostomy has a low mortality and morbidity and is considered an adequate procedure. Choledochocystoduodenostomy has a higher morbidity.

Each succeeding review of the literature shows a significant increase in the number of cases reported and in the number accurately diagnosed preoperatively. There has been also a decrease in the operative mortality and a tendency toward removal of the choledochal cyst as the treatment of choice.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Muscle Plastic Operations for Facial Paralysis. HERBERT CONWAY. *Ann. Surg.*, 1958, 147: 541.

THE DEFORMITY and dysfunction resulting from facial paralysis and their effect upon the psychological state of the individual indicate the need for restoration of facial support and re-animation of the paralyzed face.

Persistent Bell's palsy, infantile paralysis, injury to the nerve in regional surgery, congenital defect, and accidental external trauma are the common causes of facial paralysis. The possibility of spontaneous regeneration must be settled before operative correction is undertaken. Spontaneous regeneration occurs in 4 to 6 weeks in those cases without definite cause. Some may recover in 5 to 6 months and occasional ones in a year. Most authors are agreed that 6 months is a sufficient length of time to await regeneration before repair is attempted.

Operative repair may be of several types. Nerve graft or nerve anastomosis, implantation of fascial strips for support of the soft tissues of the face, transplantation of muscles or combinations of these are the common procedures.

Nerve anastomoses have been of two types. The spinal accessory nerve has been anastomosed to the peripheral portion of the facial nerve. The second method has been to use a portion of the hypoglossal nerve for the anastomosis. Successful results have been reported with both operations. Fascial suspension has been most commonly done by inserting strips of fascia lata to support the muscles. Various workers—Fischer, Brook and Hanrahan, Owens, Barsky, Fogl-Andersen, J. B. Brown, and Gillies—have described methods of using such fascial strips. Fascial slings have been used together with muscle transplantation by Matthews, Adams, and Clarkson. Muscle transplants have been employed in an effort to produce facial animation. The masseter muscle has been the one used most frequently. Rosenthal, Lexer, Jianu, Fenwick, Hasting and others have all reported experiences with this method of repair. Management of the palpebral deformity has been carried out in procedures described by Kunt-Szymanski and McLaughlin in which strips of temporalis muscle have served to correct the deformity.

Analytical data are presented on 326 cases of facial paralysis. Reparative surgery was carried out in 108 operations. Anastomosis of the hypoglossal or the spinal accessory nerve to the facial nerve was done in 25 instances. The results were very good in 16 of these patients.

Supportive facial surgery using fascial slings alone has been disappointing. Re-animation by transplantation of muscles has been employed with acceptable return of function in 10 (55 per cent) of 18 patients. The McLaughlin technique was found to be more effective than the Lexer-Rosenthal procedure. In one patient, the sternocleidomastoid muscle was used as suggested by Schottstaadt, Larsen, and Bost. Necrosis of the muscle in this case caused failure of the method. Rehabilitation in this series was best accomplished by resorting to multiple operative procedures. Nerve anastomosis was used in the early months to preserve muscular tone; supportive operations, namely, rhytidectomy or fascial strips to overcome sagging of the facial tissues and redirection of muscular insertions to provide re-animation were also done.

The problem of rehabilitation of the paralyzed face is an individual one for each patient. The solution would appear to depend upon the use of many techniques which apply to the individual patient until adequate restoration has been achieved.

—Donald C. Geist, M.D.

EYE

The Use of Tenon's Capsule in Strabismus Surgery. FRANCIS HEED ADLER. *Am. J. Ophth.*, 1958, 45: 15.

A STRIP of Tenon's capsule was used to replace a rectus muscle in 3 cases of strabismus, each of which resulted from a previous tenotomy of the muscle. The cosmetic and functional results obtained were unexpectedly good, suggesting that some of the muscle fibers were in the fascial strip. The technique of preparing the fascial strip over the site of the destroyed muscle is described. The procedure is recommended in any case of strabismus in which a muscle appears to be absent, either a congenital condition or one following surgery.

—J. Jack Stokes, M.D.

Optic Neuropathy of Exophthalmic Goiter (Graves' Disease). JOHN W. HENDERSON. *Arch. Ophth.*, Chic., 1958, 59: 471.

SIX CASES of an infrequent and seldom-recognized disorder of the optic nerve occurring during the course of Graves' disease are described.

These six cases are correlated with 10 other cases recently reported from two different sources. On the basis of the study of this combined series, some con-

clusions are drawn as to the behavior of the disease.

The disorder is manifested by the demonstration of either central scotomas or defects of the nerve-fiber bundle on testing of visual fields. Its clinical course is similar to so-called retrobulbar neuritis. To help differentiate retrobulbar neuritis from the disorder under discussion the term "optic neuropathy of Graves' disease" is proposed.

Neither the clinical status of the thyroid gland at the onset of the disorder nor the usual treatments prescribed for the basic thyroid-pituitary dysfunction seem to have any influence on the course of the optic neuropathy. The disease has a good prognosis in that the majority of the patients have return of useful vision.

Some theories as to the possible pathogenesis of the optic neuropathy are discussed.

Operating Room Gonioscopy in Angle-Closure Glaucoma Surgery. ROBERT N. SHAFFER. *Arch. Ophth.*, Chic., 1958, 59: 532.

IT IS GENERALLY accepted that iridectomy is the most logical, most effective, and safest operation for the control of angle-closure glaucoma. However, if the anterior chamber angles are occluded by permanent peripheral anterior synechiae, the procedure is ineffectual.

In order to assess the permanence of these synechiae, the author advises the use of gonioscopy with the Koeppe contact lens during the surgical procedure. If it can be seen that the iris has fallen away from the trabeculum, a routine *ab externo* peripheral iridectomy is performed. If extensive anterior synechiae are present several courses may be considered: a synechialysis, an inverse cyclodialysis, or the peripheral iridectomy may be converted into an iridencleisis.

Postoperatively, it is important to dilate the pupil once a day for the first week or two.

—J. Winston Duggan, M.D.

Histopathology of Primary Endothelial-Epithelial Dystrophy of the Cornea. H. H. CHI, C. C. TENG, and H. M. KATZIN. *Am. J. Ophth.*, 1958, 45: 518.

THE AUTHORS' STUDIES were made on 28 pathological corneas which were removed at keratoplasty. The essential histopathological findings appeared in the endothelium. The changes in Descemet's membrane, the stroma, and epithelium seem to be secondary. It is generally accepted that Descemet's membrane is a product of the endothelium and it can be regenerated if the endothelium is present.

Special staining shows that Descemet's membrane consists of two layers, an elastic layer and a posterior mucoprotein layer. In the early stages the endothelial cells with cytoplasmic bodies appear large; they coalesce anteriorly with Descemet's membrane to form excrescences. Eventually the endothelial cells burst and disintegrate. New regenerated cells then appear.

The clinical course of this disease probably depends on the extent of regeneration of the endothelium. Clinically the disease is so slow that many cases never advance beyond the early stages. Keratoplasty may be successful in cases in which healthy peripheral endothelium is present; the graft should be large enough to include all the diseased parts of the cornea. No light has yet been thrown on the etiology of this condition.

—Earl H. Merz, M.D.

The Thermal Effect on Ocular Tissues of Surgical Diathermy Currents with Frequencies Used in Treatment of Detached Retina. S. RODMAN IRVINE and HENRY A. KNOLL. *Am. J. Ophth.*, 1958, 45: 113.

THE AUTHORS studied the effect of diathermy on the ocular tissues. Cats were used as experimental animals and a thermocouple was used to measure the temperature rise in procedures similar to retinopexy. Later experiments were performed on the cornea to eliminate the changes due to blood flow.

The practical implications of the observations noted were that the current and consequent heating effect varied from one application of the electrode to another depending on: (1) area of contact, (2) inherent extracellular and intracellular fluid content, (3) blood flow, and (4) resistance of the tissue as seen in charring or drying.

When the cornea was penetrated temperature rises were great, indicating that penetrating through the sclera and contacting vitreous might cause marked vitreous changes.

Subretinal fluid could be heated until retinal changes were noted.

In conclusion the authors suggest the surgeon know his own machine and start with too little current rather than too much. When penetration occurs with a drop in electrical resistance, it should be remembered that an increased surge of current can be expected.

—Earl H. Merz, M.D.

EAR

New Middle Ear Mechanisms for Normal Hearing. SAMUEL ROSEN. *Arch. Otolar.*, Chic., 1958, 67: 428.

THE AUTHOR briefly reviews Helmholtz's theory that the middle ear apparatus (drum and three ossicles) serves as a "sound transformer" by reinforcing the sound pressure striking the eardrum. In this way the greater acoustic impedance of the cochlear fluids is overcome. This transformer action has been accepted as a necessary precondition for normal hearing.

In the present article the author questions the validity of this theory of middle ear physiology. He alleges to demonstrate the "normal ear in man can continue to hear normally after the incudostapedial articulation has been widely and irreversibly separated, thereby interrupting the middle ear transformer mechanism." Further he believes "that normal hearing can be achieved and maintained after Rosen's fenestra ovalis operation through the rigid and immobilizable footplate." Five case reports are included.

This article is preceded by an editorial comment from which the following quotation is taken.

"These observations are, of course, disturbing to all currently accepted theories of middle ear function. It is difficult to reconcile these reports with other observations by the same author in which he shows equally excellent results where ossicular continuity was maintained. One wonders as to the fate of the average 26 db. contributed by the impedance matching mechanism of the middle ear as a transducer or

acoustic transformer. This normal 26 db. contribution of the middle ear has been demonstrated time and time again in experimental studies and in clinical observations involving stapes surgery, fenestration surgery, and tympanoplasty.

"Furthermore, it is not clear as to what fate befalls the opening in the footplate from which undoubtedly a large amount of perilymph must be lost, since no mention is made of any covering to this footplate fenestra. One also wonders as to the fate of the utricle and saccule, which could very easily be disturbed by the type of instrument used in producing a footplate fenestra. Some otologic surgeons have observed cerebrospinal fluid leaks following footplate instrumentation of even less magnitude."

—John J. Ballenger, M.D.

Surgical Treatment of Labyrinthine Disharmony. JOHN J. BALLENGER. *Ann. Otol. Rhinol.*, 1958, 67: 77.

THE AUTHOR's opening remarks indicate the decreasing incidence of suppurative labyrinthitis since the introduction of antibiotic therapy. He indicates that most of his experience with suppurative labyrinthitis concerns experiences prior to the introduction of sulfonamides and antibiotics.

Various procedures for the management of suppurative and nonsuppurative labyrinthine disease are referred to by the author and a number of interesting illustrations are included in the original article. Surgical treatment of the autonomic nervous system is apparently not yet on a firm basis, and the author indicates that this procedure should not be recommended except as an experimental approach. Its sole indication is apparently in cases in which there is great necessity to preserve hearing.

The postoperative condition of patients who have had bilateral destructive labyrinthotomy is apparently so severe that the patients cannot walk unaided, drive a car, or participate in many normal daily activities.

—Moris Horwitz, M.D.

Fibrosing Mastoiditis; Its Relation to Adhesive Otitis Media, Granulomas of the Facial Nerve, and the Conservation of Hearing. WENDELL A. WELLER. *Ann. Otol. Rhinol.*, 1958, 67: 112.

THE AUTHOR ably describes the complications and management of fibrosing mastoiditis and its relation to adhesive otitis media, granulomas of the facial nerve, and the conservation of hearing. Eleven cases are reported including the clinical, bacteriological, radiological, and operative findings. Reproductions of the microscopic studies and sketches of the operative findings are presented. This article should be read by all physicians directing the management of patients with disease of the ear, nose, and throat.

—Moris Horwitz, M. D.

Complications of Mastoiditis in the Antibiotic Era. RUFUS C. MORROW. *Ann. Otol. Rhinol.*, 1958, 67: 41.

PRIOR TO THE ADVENT of the introduction of antibiotics the clinical otologist with experience was able to "sense the danger signs in his patient's course and feel the need for surgical intervention." The clinical course and roentgenographic evidence of mastoiditis has been greatly obscured, however, with the introduction of antibiotic therapy, which in many cases is insufficient to cause complete resolution of the inflammatory process present, and hidden dangers with local and remote complications are being reported much more frequently. The present article is a review of the experience of 5 years in the author's institution to present the present day viewpoint regarding mastoid therapy.

The patients analyzed by the author include 90 with mastoiditis who were admitted between September 1, 1951 and August 31, 1956. Of these 90 hospitalized patients 43 had acute or sub-acute mastoiditis and of the latter 20 were subjected to mastoidectomy. The remaining 47 were grouped as having chronic mastoiditis and 28 of these were subjected to mastoid surgery. Three patients in the latter group had previous surgery on the mastoid many years before the beginning date of the present series and one patient with a chronic condition had had operations on both ears.

Among the 90 cases analyzed were 21 with known complications. Eleven of these were among those classified as acute or subacute and 10 as chronic. The complications included 9 cases of meningitis, 3 cases of lateral sinus thrombosis, one case of lateral sinus thrombosis with brain abscess, 4 cases of epidural abscess, one case of cerebritis, one case of facial paralysis, and 2 cases of subperiosteal abscess.

The summary and conclusion of the author are exceedingly well presented and include indications for surgical intervention. *—Moris Horwitz, M. D.*

MOUTH

The Development of the Center of the Face, with Particular Reference to Surgical Correction of Bilateral Cleft Lip. RICHARD B. STARK and NORBERT A. EHRMANN. *Plastic & Reconstr. Surg.*, 1958, 21: 177.

THE AUTHORS describe a study of the development of the face as carried out on 6 human embryos with cleft lip and palate, in an attempt to define the role of the prolabium in the repair of bilateral cleft lip.

The normal embryology of the region is reviewed.

The pathogenesis of cleft lip and palate is outlined with emphasis on the importance of mesodermal penetration. If such penetration does not occur, secondary mesenchyme fails to grow into a pre-existing epithelial wall and the several anomalous forms of developmental error may occur.

Stress is also laid on the interaction of unspecified genetic and intrauterine environmental factors.

The authors contend that the prolabium is a lip structure and that it should be used as the central element in the repair of bilateral cleft lip. If this structure alone is used, a normal philtrum will develop, but if it is used as the columella of the nose, it may result in a hirsute columella, an elongated lip, and absence of the philtrum.

It was also maintained that an alveolar cleft is a lip anomaly only and that a cleft lip is complete only if the alveolus is cleft. As a corollary of this, it follows that a palate is completely cleft if it is cleft as far anteriorly as the incisive foramen. On this, the authors base a new classification of anomalies of the cleft palate. *—John R. Lindsay, M.D.*

Correction of Prognathism by Subcondylar Osteotomy. EDWARD C. HINDS. *J. Oral Surg.*, 1958, 16: 209.

THE TWO most favored procedures for treatment of mandibular prognathism, up to the present time, have been osteotomy of the ramus and bilateral ostectomy of the body of the mandible. In spite of many excellent results, however, both of these procedures are fraught with serious difficulties and potential complications. Ideally, in most instances of prognathism, the goal should be to set back the entire mandibular arch which allows conservation of all remaining teeth as well as improvement of the gonial angle. A procedure in the ascending ramus will allow such an accomplishment.

A 2.5 cm. incision is made beneath the angle of the mandible by blunt and sharp dissection. Care is taken to retract the facial nerve. The masseter muscle is exposed and separated from the mandible. The muscles are then stripped from the lateral aspect of the angle and ramus of the mandible to expose the coronoid process, sigmoid notch, and condyle. Vision is obtained with a headlight. Through this small incision the entire lateral aspect of the ramus can be visualized adequately.

Drill holes are made on a line extending obliquely from the sigmoid notch to a point just superior to the angle of the mandible. No. 8 round burs are used with a straight handpiece. The drill holes are extended, a groove is cut, and the osteotomy cut is finished with an osteotome. The masseter and internal pterygoid muscles are separated from the posterior fragment sufficiently to allow lateral placement of the posterior fragment over the anterior fragment. The same procedure is carried out on the opposite side.

Direct wiring of the fragments has not been done and does not seem to be necessary.

The teeth then are placed in occlusion, and the wound is closed in layers, using No. 000 chromic catgut in the muscles and subcutaneous tissue and No. 0000 nylon interrupted in the skin. No drains are placed. A moderate pressure dressing is applied.

—John J. Ballenger, M.D.

NECK

Cystopapillary Tumors of the Thyroid Gland (Sulle neoformazioni cistopapillifere della tiroide). B. MALANDRA and E. DOVA. *Tumori*, Milano, 1957, 43: 417.

NEW GROWTHS of a papillary type arising in the thyroid gland are not rare, and the histopathologic and clinical findings are well known; it has been observed, however, that despite pathologic impressions of benign growth there is reasonable ground for suspicion that these tumors are malignant in their activity. In some instances there is evidence of distant growth outside the thyroid gland, in the lateral cervical glands, and sometimes into the integument. It would appear that there are instances in which the diagnosis of "aberrant thyroid gland tumor" is in error and that the true diagnosis is that of "metastatic papillary tumor of the thyroid gland, with extension into cervical lymph nodes."

Five cases are presented of patients ranging in age from 7 to 54 years. Each of them presented evidence of swelling in the area of the thyroid gland. The 7 year old child had evidence of numerous involved lymph nodes in the neck so that there was some diagnostic question of the possibility of tuberculous adenitis. Excision of one submandibular node and microscopic examination revealed the nature of the extensive tumefaction. Two patients were given I^{131} as a diagnostic test. The thyroid retention for one was 54 per cent in 48 hours, for the other 29 per cent in 24 hours; 74.5 and 67 per cent, respectively, was eliminated in the urine in a 48 hour period.

Histologically, the tumors were frequently found to be cystic with irregular papillary growth into the cystic area. The papillae were covered with cuboid epithelium, which was usually in single layers, but occasionally in the form of multiple layer stratification.

Some normal elements of lymph nodes were frequently seen, but involvement by papillary tumor could easily be found. In several instances the tumor proved to be so undifferentiated that the cells could be identified only as being of epithelial origin.

The authors have concluded that papillary tumors of the thyroid gland may appear histologically benign, but that invasion of the lymphatic channels does occur with later evidence of growth in the lateral cervical lymph nodes. They warn against the term "carcinoma in a lateral aberrant thyroid gland," and urge serious consideration of a primary tumor in the thyroid gland with metastasis to regional lymph nodes.

—Walter L. Byers, M.D.

Sarcoma and Carcinosarcoma of the Thyroid (Contributo casistico allo studio del sarcoma e del carcinosarcoma della tiroide). G. PRUSSIA and T. MONTINI. *Rass ital. chir. med.*, 1957, 6: 589.

THE AUTHORS report on 2 patients who were treated for tumor of the thyroid gland at the University of Genoa. The first patient, a 47 year old female, was found to have a tumor mass on the right side of the neck about the size of a hen's egg. A smaller tumor was present on the left side. At operation the tumor was found to invade the cricothyroid muscles and the trachea. Both lobes were excised. The postoperative course was normal and the patient was then given x-ray therapy. She was seen 2 months later with a recurrence on the right side and a tracheotomy was necessary because of respiratory difficulty. The pathologic report was sarcoma.

The second patient was an 80 year old female who first noted a mass in the right side of the neck when she was 35 years old. It grew to the size of a large egg in 2 years and then remained the same size until one year previous to her admission when it began to increase in size and increased quite rapidly for the period of a month.

The growth caused difficulty in respiration.

The patient was operated upon and a subtotal excision of the mass carried out which relieved the dyspnea and cyanosis. The patient appeared to be much improved but during the night she went into shock and died the next morning. The pathologic report was a mixed malignant tumor with carcinomatous and sarcomatous elements.

—Lucian J. Fronduti, M.D.

Bilateral Blindness Following Thyroidectomy (Doppelseitige Erblindung nach Basedowoperation). FR. GROSS. *Zbl. Chir.*, 1958, 83: 305.

COMPLICATIONS of surgical operations are not reported as frequently today as formerly, possibly because lawyers today are scanning medical literature for so-called technical errors more freely. Nevertheless the author feels bound to report the following case.

A 40 year old woman who, following the birth of her first child 21 years ago, had had frequent attacks of phlebitis, bilateral thrombosis of pelvic veins, and ulcer of the leg, underwent, after proper preparation, a thyroidectomy for Basedow's disease with exophthalmos. The surgeon was experienced in thyroid surgery and the anesthetic, given by an experienced nurse anesthetist, was evipan-nitrous oxide, after premedication with megaphen-atosil. The 2 hour operation was entirely without complications. The patient's pulse and blood pressure were normal. There was no lack of oxygen and no undue blood loss. The thickened vessels of the superior pole were ligated without the usual injection of novocain-suprarenin.

When the patient awoke four and one-half hours after the operation she found that she was blind in both eyes. An ophthalmological consultant was immediately called and he diagnosed the condition as an acute bilateral retinal edema. In spite of intramuscular and intravenous injection of massive doses of dilating drugs, a bilateral atrophy of the optic nerve developed that allowed only peripheral vision. Nevertheless the patient resumed her work as a telegraph operator.

Two and one-half years later she had a sudden pain in the left breast and scapular region. On roentgenographic examination, an infiltrating mass with a central necrosis was found in the upper lobe of the lung. A strongly positive tuberculin test confirmed the diagnosis. She is now undergoing treatment for tuberculosis.

A further finding, which was discovered immediately on awakening, was a disturbance in sensation in the region supplied by the upper branch of the trigeminus, which gradually disappeared in the course of 3 weeks. This would seem to point to the region close to the hypophysis as the seat of the cause of the complication, possibly a circulatory anomaly, thrombosis, or hemorrhage. Other possible causes considered were pressure of the anesthesia mask on the eyes or injury to the optic nerve by some lesion between the chiasma and bulb.

However, the cause of this complication remains unsolved and the case is reported in the hope that it may lead to the reports of similar cases.

—Alfred H. Noehren, M.D.

Carotid Body Tumors (I tumori del glomo carotideo). MARIO MARGOTTINI and ANTELIO FICARI. *Arch. ital. chir.*, 1958, 83: 89.

THE AUTHORS, after a brief review of the evolutional and morphological aspects, and a summary of the symptoms and diagnosis, of tumors of the carotid body, report 2 personally observed cases.

Tumors of the carotid body are reported in the literature under various names. The authors prefer the term "tumor of the carotid body" since such tumors display only one type of histogenesis fundamentally.

The evolution of the tumor is characterized by slight and gradual development and the symptoms are late. Preoperative diagnosis is made in 10 to 15 per cent of the cases. The treatment of choice is surgical excision. The malignant nature of the tumor is not identified by its histological character and for this reason biopsy is not helpful. One should avoid resection of the carotid artery because of the benign nature of most of the carotid body tumors.

—Alexander J. Conte, M.D.

Carcinoma of the Frontal Sinus and Larynx Following Occupational Trauma (Carcinoma del seno frontale e carcinoma del laringe conseguenti ad infortunio sul lavoro). PIER LUIGI REMAGGI. *Arch. ital. pat. Clin. Tumori*, 1957, 1: 1100.

THE AUTHOR reports the cases of 2 patients seen at the University of Modena. The first was that of a 63 year old man who struck himself above the left eye with the handle of a pick while at work. The pain subsided in a day or two. About 2 months later pain appeared in the frontal sinus and gradually became worse. One month following this a tumor began to develop in the area and 2 months later the tumor was excised and found to be an epithelioma.

The second patient, a 51 year old male, ingested a large amount of naphtha. This caused considerable pain in the throat which subsided but never disappeared completely. About 5 months later he began to notice some dysphonia and dysphagia. He was then found to have a tumor on the epiglottis. A biopsy was obtained and the lesion proved to be an epithelioma. Since the lesion was considered localized total laryngectomy was advised but the patient refused. He was given roentgen therapy but expired about 18 months following the ingestion of the naphtha.

The author reviews the literature on the relationship between trauma and neoplasm. He believes that trauma was responsible for the carcinoma in both of these patients. The laryngeal tumor was approved by the compensation institute and the second case was in the process of being adjudicated and the author felt it would be approved.

—Lucian J. Fronduti, M.D.

Sarcoma of the Larynx; A Review of the Literature, the Presentation of 2 Cases of Reticulosarcoma, and a Consideration of the Histology and Therapeutic Management (Contributo allo studio del sarcoma della laringe; revisione della letteratura, presentazione di 2 casi di reticolosarcoma, considerazioni istogenetiche e terapeutiche). G. GALETTI and S. RUSSO. *Arch. ital. pat. Clin. Tumori*, 1957, 1: 733.

TWO CASES of reticulosarcoma of the larynx are presented which have been encountered in a period of some 7 years by the authors. They point out that although this type of tumor is rarely found in the larynx, a complete study of the previously reported cases along with the 2 cases which they add should be a welcome contribution to the statistical summary.

The first patient was a 64 year old female who was brought to the Otorhinolaryngologic Clinic at the

University of Modena because of severe stenosis of the larynx. On March 16, 1950, a primary examination was done with a laryngoscope, revealing a mass which occupied the laryngeal vestibule. An emergency tracheostomy was performed, and the trachea immediately cannulized. The familial, physiologic, and pathologic history of the patient was noncontributory.

The patient had noted evidence of dysphonia about 6 months before. It had been a progressive symptom, ultimately and more recently accompanied by dysphagia for solid foods and by cough. The patient had not noted any marked weight loss. About 15 days before the admission she had made an appointment with the medical department to be seen at the Otorhinolaryngologic Clinic for diagnosis and therapy. Laryngoscopic examination following the emergency treatment revealed a roundish, fleshy mass, of a red-wine color. It was the size of an average peach seed and occupied the laryngeal vestibule. By laryngoscopy it was not possible to determine the exact extent of the lesion or of its involvement of other tissues. There was no appearance of regional metastases. Biopsy of the lesion was performed and the specimen forwarded for study to the Institute of Pathologic Anatomy at Modena.

A report of the gross and microscopic findings revealed that little in the way of normal architecture of the larynx could be seen. The tissue appeared to be a tumultuously proliferative specimen of neoplasm, apparently of mesenchymal origin. The cells themselves varied from round to polygonal in appearance. The cytoplasm appeared to be deposited in small bundles. Microscopically, it was not possible to determine the basic derivation of the mesenchymal tumor.

Treatment consisted of a total laryngectomy following the induction of general anesthesia. The postoperative course was uneventful and the patient left the hospital in 8 days. A short time later roentgen therapy to the extent of 3,000 roentgens was given to the lateral cervical area. Within 5 months there was evidence of further lymph node involvement and additional therapy was directed to the nodal areas. The patient expired about 17 months after first being seen in the Clinic.

The second patient was a 57 year old male who appeared to be in generally good health. His chief complaint was that of dysphonia of a progressive nature over a period of about 20 days. Laryngoscopy was performed and revealed a pedunculated tumor of the left vocal cord. It was described as being about the size of a large pea, red in color, and with a shiny surface. Motility of the cords was intact. At first the lesion was thought to be a polyp of the vocal cord, but upon removal and microscopic section proved to be reticulolymphosarcoma.

The patient received roentgen therapy to the involved area and to the lateral cervical area. About 16 months later the patient again returned to the clinic with severe cyanosis and dyspnea. Roentgenograms revealed tumor involvement of the mediastinum. He expired about 2 years after first being seen at the Clinic.

A careful review of the literature reveals approximately 26 reported cases of fusocellular laryngeal sarcoma. Other types reported are:

Chondrosarcoma	4
Myxochondrosarcoma	1
Fibromyxosarcoma	2
Angiosarcoma	1
Polymorphocellular sarcoma	6
Reticulosarcoma	7
Lymphosarcoma	5
Myosarcoma	10

The authors believe that since the better therapeutic result in the undifferentiated type of tumor is obtained with roentgen therapy, surgery should be reserved for the less extensive and more differentiated type of lesion. —*Walter L. Byers, M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Angiography in Cranial Cerebral Trauma (L' arteriografia nei traumi cranio-encefalici). SESTILIO GABRIELLI. *Rass. ital. chir. med.*, 1957, 6: 1237.

THE AUTHOR describes the techniques of cerebral angiography as applied to the diagnosis and treatment of head injuries. He apparently believes that the procedure is harmless and uses it routinely in the patients under his care. He believes the procedure to be of special value in determining the need for surgical intervention in the instance of a subdural or extradural hematoma.

This extensive article of 46 pages is well illustrated with reproductions of cerebral angiograms obtained in patients who suffered craniocerebral trauma.

—*Nicholas Wetzel, M.D.*

The Tentorial Notch and Complications Produced by Herniations of the Brain Through That Aperture. SYDNEY SUNDERLAND. *Brit. J. Surg.*, 1958, 45: 422.

THE AUTHOR points out the great importance of recognizing the significance of false localizing signs due to displacement of temporal lobe tissue through the tentorial notch. An exhaustive bibliography of previous descriptions of this entity is incorporated within the article. The author believes that the exact anatomic features of the region about the notch have not received due attention, and proceeds to describe the area in elaborate detail and to emphasize the special features leading to recognizable clinical entities. The description includes the relation of the temporal lobe, brain stem, cerebellum, and corpus callosum to the tentorial notch, along with that of the oculomotor, trochlear, and abducens nerves. The related course of the posterior cerebral, posterior communicating, and anterior choroidal arteries is outlined fully, along with that of the great vein of Galen and the basal veins.

Following the presentation of anatomic data, including a large group of photographs of pathologic specimens, the author describes the consequences of unilateral supratentorial expanding lesions in terms of their effect upon the previously noted structures in the area and the clinical syndromes which then appear. The consequences of bilateral or generalized conditions resulting in raised supratentorial pressure are described, as are the effects of subtentorial expanding lesions. The author stresses the fact that some conditions responsible for tentorial herniation are fully reversible and as they subside the herniation is reduced spontaneously. The nonreversible types require craniotomy which may fail unless measures are directed at the site of impaction itself. He likewise notes that following herniation, ischemic sclerosis of hippocampal structures may become the background of psychomotor epilepsy of temporal lobe origin. Head injury, in addition to expanding lesions, is a possible producing cause.

—*Edward B. Schlesinger, M.D.*

The Technique of Percutaneous Destruction of the Hypophysis with Radioactive Gold (Zur Technik der percutanen Hypophysenausschaltung durch radioaktives Gold). K. H. BAUER and E. KLAR. *Chirurg*, 1958, 29: 145.

IN 1948 the authors first employed a percutaneous puncture of the sella turcica in order to destroy a hypophysial tumor by electrocoagulation. Using a transethmoidal or transsphenoidal approach, they have treated 55 patients with tumors of the pituitary without an operative death; 32 were treated with electrocoagulation and 23 by radioactive gold implantation. They have also applied these techniques of ablation of the pituitary to 181 patients with incurable cancer. In 17 instances electrocoagulation was used, and in 164 instances radioactive gold implantation was employed. In their total experience with 247 operations in 236 patients, they have had but one operative death (cardiac arrest following the procedure and prior to extubation). The procedure they presently employ and recommend, involves a percutaneous transethmoidal puncture of the sella turcica under x-ray control using an image-intensifier, with destruction of the pituitary by means of 20 to 40 mc. of radioactive gold implanted in the sella turcica.

Radioactive seeds of Au 198 are employed. The halflife is 2.7 days with a maximal beta energy of 0.96 m.e.v. and a gamma energy of 0.41 m.e.v. After 2 weeks, 95 per cent of the activity is dissipated. Utilizing small seeds, a dose of 1,000 roentgens per mc. is delivered to an area of 5 mm. from the fragment. Using special techniques and a microtomelike

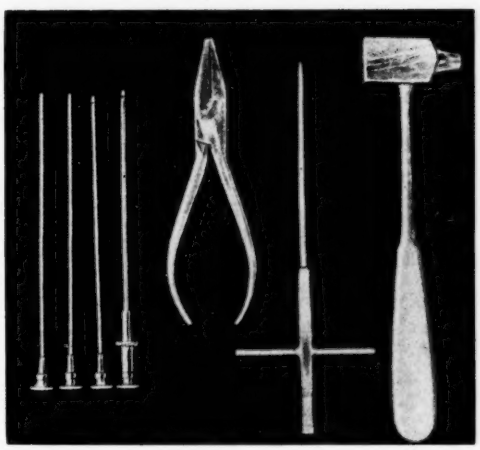


FIG. 1 (Bauer, Klar). a, Hollow needle with a sharp stylet and 3 blunt ones for placement of the gold seeds. b, Pliers for extraction of the cannula. c, Leukotome. d, Hammer for placement of the cannula.

FIG. 2. Position of the needle prior to its insertion.

instrument, the gold seeds are cut into sizes 2 to 4 mm. long (depending on the activity of the gold), the width being 0.3 mm. Three to 4 seeds, with a total activity of 40 mc., are placed as centrally within the sella turcica as possible.

The instrumentarium required for the procedure is pictured in Figure 1. A general anesthetic under tracheal intubation is used. Intubation is necessary to prevent aspiration of blood. In about 10 per cent of the procedures, bleeding into the nasopharynx occurs. The bleeding has never led to serious complication.

After preparing the skin, the right eyeball is pushed laterally and the leukotome is placed through the medial wall of the orbit at the level of the upper half of the medial palpebral ligament between the eyelid and the root of the nose. The instrument should pierce the medial wall of the orbit perpendicular to its surface (Fig. 2). The needle should be perpendicular to the obliquely inclined bony surface or about 45° from the vertical. The photo is taken showing the view of the operator. As soon as the bone is pierced, the awl is removed and the needle with the sharp stylet is inserted. The needle is positioned at an angle of 6 to 8 degrees from the midline (Fig. 3). Under roentgenographic control, utilizing lateral views, the needle is advanced in the direction of the sella turcica. A decrease in resistance is felt as the needle enters the sphenoidal sinus and before it reaches the wall of the sella. At this latter point, the view used to observe the position of the needle is changed so that the base of the skull is visualized by means of axial views (Fig. 4). The sella is pierced in the midline. The needle is then placed 3 to 5 mm. into the sella turcica, lateral views being used for positioning.

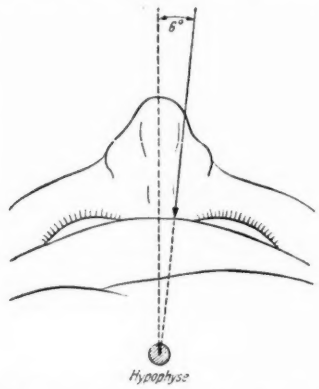


FIG. 3. Paranasal location of needle insertion relative to midline.

FIG. 4. Position of the image intensifier in visualizing the base of the skull.

At this point, removal of the stylet may result in either venous bleeding or a discharge of cerebrospinal fluid. Advancing the needle 1 to 2 mm. will obviate the former. When the position of the needle is definitely ascertained to be in the middle of the sella, the radioactive gold seeds are inserted. Their position is also verified roentgenographically and the needle is removed. Care should be taken not to remove a radioactive fragment along with the needle.

After some experience and with close cooperation of all members of the operative team, the procedure should take about 6 to 8 minutes. The risk of the procedure is minimal. Studies on the efficacy of the destruction of the pituitary gland by this technique attest to its usefulness and will be reported at some future date. —*J. C. Rosenberg, M.D.*

Modified Leucotomy: Report of 100 cases. KEITH C. BRADLEY, E. CUNNINGHAM DAX, and KEVIN W. WALSH. *Med. J. Australia*, 1958, 1: 133.

THE AUTHORS review the previous studies of modified leucotomy, make mention that as early as 1945 Dax and Radley Smith pointed out the advantages of dividing the frontothalamic fibers in that region above the orbitomedial cortex, and state that they used first

the techniques of selective leucotomy. The present report concerns their results following division of the fibers in the ventromedial area of both frontal lobes, with a modified McGregor leucotome, the sections being made in the coronal plane just anterior to the tips of the anterior horns of the lateral ventricles. With their technique it would appear possible to reach this particular area of white matter through a burr hole a little more than a centimeter in diameter, without damaging the overlying cortex or intervening white matter. The authors feel that the localization of the section is extremely accurate and that the modified operation leads to no undesirable personality changes.

In their selection of patients great emphasis is placed not only on the nature of the symptoms, but especially upon their premorbid personality and social and work record. They think that it is perhaps unwise to subject a patient to even this modified form of leucotomy if only one of the aforementioned factors is definitely unsatisfactory. The patients who do best following this modified operation seem to be those with psychotic depression, and these form the largest part of the present series. The second largest series of patients consists of those with neurotic depression and a small group of some 10 patients with obsessive-compulsive neuroses or obsessive-ruminative tension states. They authors think that this operation is perhaps not too likely to be successful in chronic schizophrenia. The level of intelligence of the patient seems to bear no relation to the success of the leucotomy.

The surgical technique is described. In this series of 100 cases, not one of cerebral hemorrhage was encountered and in the 3 years covered by this series, not one postoperative epileptic fit was recorded nor one case of fecal or urinary incontinence, even directly after the operation. The operative mortality in this series was nil.

For evaluation of the results, the series was divided into two groups. Group I was thought by the selectors to provide patients who would obtain maximum relief or improvement from the operation. Group II comprised young schizophrenics for whom it was considered that the operation was justified, in that there still remained some chance of improvement in their condition.

The authors believe that this procedure is very definitely worthwhile since the larger percentage of their patients in the first group had excellent results and few, if any, of the patients were made worse.

—*Nicholas Wetzel, M.D.*

The Operative Treatment of Peripheral Facial Palsy (Die operative Behandlung der peripheren Facialislaehmung). C. R. PFALTZ. *Schweiz. med. Wschr.*, 1958, 88: 251.

IN THIS ARTICLE the author deals with the various aspects of rheumatic or idiopathic facial palsy (Bell's palsy) and facial palsy of traumatic origin; the inflammatory form and the form which results from a space-occupying lesion are not discussed.

The numerous theories with regard to the origin of Bell's palsy are discussed. Possible causes are viral diseases (herpes zoster, poliomyelitis, and coxsackie), allergic reactions, and vascular changes. The latter, mainly due to cold, result in spasm of the stylomastoid artery and subsequent capillary stasis with edema formation (first of the nerve sheath and subsequently of the medulla) causing swelling of the nerve. The swelling eventually may lead to incarceration of the nerve in its bony canal. Pressure necrosis has been observed on histologic examination (Kettel, Jongkees).

Conservative therapy is aimed at relieving vascular spasm with the aid of vasodilators, ganglion blocking agents, by physiotherapy with local heat, massage, and electrical stimulation, and by local infiltration of the stellate ganglion.

Surgical intervention should be instituted in cases in which paralysis does not show any signs of spontaneous regression within 2 months, in cases of recurrent facial palsy, and in cases of incomplete paralysis which have become stationary. In the last instance decompression should be performed within 9 months from the onset of the palsy. All 4 patients with Bell's palsy operated upon by the author showed good end results.

The question is different in regard to the traumatic type of facial palsy. This condition demands immediate exposure of the nerve without any delay if paralysis follows the injury.

Compared to the longitudinal fractures, the transverse fractures have a relatively poor prognosis. Hahn (1955) found irreversible paralysis in 30 to 50 per cent of transverse fractures compared to 10 to 25 per cent of longitudinal fractures.

In those cases of facial palsy in which an interval of some hours or days lies between the injury and the first symptoms of facial palsy, it is customary to follow conservative therapy (cortisone, physiotherapy) for 4 to 6 weeks. In the 8 patients treated by the author for this condition (3 showing the delayed palsy) good functional results were obtained by decompression of the facial nerve. —*Henry Gans, M.D.*

SPINAL CORD AND ITS COVERINGS

Cervical Discography: Technique, Indications and Use in Diagnosis of Ruptured Cervical Discs. RALPH B. CLOWARD. *Am. J. Roentg.*, 1958, 79: 563.

THE AUTHOR discusses the roentgenographic visualization of the intervertebral disc by injection of radiopaque materials as applied to the cervical spine. His technique is described in detail and at the time of writing of this article, 41 clinical cases were done over an 18 month period. He believes that the procedure is relatively safe and simple and may offer some diagnostic advantages over other methods used for detecting the presence of disease in the cervical region. He does not think that the interpretation of the roentgenographic findings has been difficult and certainly the reproductions of the roentgenograms in the paper are striking. —*Nicholas Wetzel, M.D.*

Subarachnoid Alcohol Block in the Management of Pain of Malignant Disease. D. M. PERESE. *Arch. Surg.*, 1958, 76: 347.

THE AUTHOR presents his results in the treatment of pain secondary to malignant disease by the use of subarachnoid block with 95 per cent alcohol. Seventy patients were treated over a 3 year period by 119

blocks. The main reason given for the increased number of blocks as compared to the number of patients was the bilaterality of the pain. An interesting departure from the usual type of lumbar alcohol block is reported by the author in that he performed this procedure in the cervical and thoracic regions as well as in the lumbosacral area. A complete description of the author's meticulous technique in carrying out these injections is given in the text of the article, as well as the indications and contraindications for this type of therapy.

Of the 70 patients, 41 had complete relief of pain, the duration varying from 2 weeks to a year or longer; 26 patients had partial relief, and 3 patients had slight or no relief. The patients who were unrelieved were later subjected to other surgical techniques for the relief of pain. Serious complications (paresis, weakness, or incontinence) occurred in 10. Nine of these patients recovered within 2 months after the alcohol injection. The remaining patient succumbed 2 weeks after the block because of progression of the malignant disease.

While this article was in press the author carried out an additional 29 alcohol blocks with no complications in 25 patients; 16 of these patients were completely relieved of pain and 6 were partially relieved.

Excellent illustrations accompanying the text serve to clarify points in the authors technique of performing alcohol injections into the subarachnoid space.

—*Joseph Ransohoff, M.D.*

PERIPHERAL NERVES

The Experimental Use of Cortisone in Peripheral Nerve Repair with Plasma Clot as a Suture. R. INDAR and R. J. M. FRY. *Irish J. M. Sc.*, 1958, p. 136.

THE AUTHORS point out that the degree of recovery of function which will occur following a peripheral nerve injury depends on the number of fibers which bridge the area of injury and reach endings in the tissue similar to that with which they were previously connected. The difficulties in obtaining a satisfactory apposition of the nerve ends and prevention of the formation of a connective tissue barrier between the sutured ends of the nerve are the two main problems that arise in the surgical repair of an injured nerve.

The authors carried out an experimental study based on 22 rabbits divided into three groups. In all of the animals the peroneal nerve of one leg was sectioned and sutured by the plasma clot technique. Eight rabbits had a course of intramuscular cortisone, 6 were given hydrocortisone either by local injection or through a polyethylene tube which had been inserted at the operative site, and the remaining 8 received no special treatment, serving as controls. The results of these studies were assessed at varying periods of time up to 100 days after the operation, at which time the animals were sacrificed and sections made of the involved nerves.

It was the authors' conclusions that the systemic and local administration of cortisone reduced the amount of fibrous tissue formed between the nerve ends and between the nerve and the nerve brain tissues. It also appeared that cortisone retarded the growth of axons into the distal stump in the first 3 weeks following the nerve sutures. This retardation was not as marked in the later weeks of the study, however. In these animals there was no difficulty with wound healing which could be attributed to the cortisone.

The authors also studied this technique in association with experimental nerve grafts. Here they thought that the use of cortisone was somewhat questionable in view of the possible reduction in vascularization of the grafts that may occur.

—*Joseph Ransohoff, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Management of Blunt Injuries of the Chest with a Special Reference to the "Cave-in" Injuries. S. S. ANAND and WARYAM SINGH. *Ind. J. Surg.*, 1958, 20: 31.

THE BASIS for this study was the observation of 75 cases of blunt injury to the chest during a 5 year period at a surgical unit in Amritsar, India. Twenty-seven of the cases were a result of a fall from a height and 25 resulted from a fight with blunt weapons. There were many associated injuries, several of which were either life-threatening or frankly the cause of death.

Ten of the patients had paradoxical respirations, 5 had flail chest, 6 wet lung, 5 hemothorax, 4 tension pneumothorax, 2 acute diaphragmatic hernia, and 1 had acute dilation of the stomach.

Emergency treatment consists of provision of an airway and decompression of a hemopneumothorax or a tension pneumothorax. Emergency tracheotomy can be a life-saving measure.

In treating uncomplicated fractures, strapping and narcotics have been abandoned completely. Paravertebral or intercostal block relieves the pain and allows the patient to cough easily.

Five of the patients had blood in the pleural cavity. Simple aspiration sufficed as treatment for 3 and none needed decortication. The 4 patients who had tension pneumothorax responded to water seal drainage.

In discussing the treatment of cave-in chest, it is emphasized that the treatment must be directed to the pathologic physiology encountered. It must relieve the paradoxical movement, relieve the pain, and control the tracheobronchial secretions. The ribs can be fixed in position in any one of a number of ways ranging from internal fixation to traction. Shock in these cases is treated by the use of blood, dextran, and intravenous fluids. Early tracheotomy should be considered in order to maintain an adequate unobstructed airway with as little dead space as possible.

Case reports are presented to illustrate the above points.

The mortality in the group of 75 patients treated was due to five causes. Wet lung with dilatation of the stomach caused one death. Other causes were: tension pneumothorax with hemothorax on the opposite side, severe head injury, tension pneumothorax with head injury, and fractured rib with delayed pulmonary embolism. —*John J. Bergan, M.D.*

Lytic Lesions of Ribs. KIRK R. DEIBERT. *South. M. J.*, 1958, 51: 523.

THE ROENTGENOLOGIC CHARACTERISTICS of 71 lytic lesions involving one or more ribs are discussed in this paper. Pott's disease can usually be recognized by the vertebral collapse and the soft tissue mass. A psoas abscess may be demonstrated on plain film of the abdomen. Destruction may be present not only in the head and neck of the rib but also in the articular and nonarticular margins of the rib. Tuberculous costochondritis is found at the anterior aspect of the rib. The destruction is usually at the costochondral junction and is accompanied by a soft tissue mass. The mass, incidentally, can be aspirated with impunity with a fine-gauge needle. Here, tuberculosis of the lung usually does not co-exist. No bony reaction nor periosteal proliferation is present, generally. Fungal disease of the chest wall which extends into the rib is usually preceded by pleuropulmonary involvement. The rib destruction is frequently extensive. Fistulas or sinus tracts which discharge infected material may be present. Fungal involvement is diffuse, bizarre, and rapidly destroys the head and neck of the rib. Multiple myeloma in its diffuse form produces porosities which are dispersed throughout the rib cage. No bony or periosteal reaction is noted. Other systemic diseases which produce diffuse, small, costal lucent areas are leukemia, polycythemia, anemia, and lymphomas.

Metastatic neoplasms produce defects which follow no particular pattern, and attention is frequently drawn to them by the presence of pain at the site. The most likely primary sites are the kidney, lung, breast, thyroid, adrenal, skin, urinary bladder, testis, or parathyroid. The sarcomatous tumors which metastasize to the ribs are Ewing's tumor, lymphosarcoma, reticulum-cell sarcoma, fibrosarcoma, chondrosarcoma, and osteogenic sarcoma. For some undisclosed reason, Ewing's sarcoma is frequently found as a posterior mass at the thoracic inlet simulating the superior sulcus syndrome. It rapidly invades the bony cupular boundaries as a Pancoast tumor does, but it is found in a young person about 20 years of age. The Pancoast superior sulcus tumor may be either primary or secondary. Frequently venous stasis is present in the upper extremity because of neoplastic encirclement of the superior vena cava, the innominate, or subclavian veins. A large dense mass usually involves the cupular zone. The sites of predilection on either side are the transverse processes of the seventh cervical to the third thoracic vertebrae and the heads, necks, and nonarticular tubercles of the upper three ribs. The benign bony tumors that invade and destroy the ribs include eosinophilic granuloma or other disturbances of lipoid metabolism, Albright's syndrome, xanthoma, osteochondroma, bone cyst, fibrous dysplasia, enchondroma, or giant cell tumor. The latter two rarely involve ribs. They all have a characteristic roentgenographic resemblance consisting of a bizarre, cystic, whorled appearance. Neither true bony destruction nor periosteal proliferation is present.

Undulations and notchings of the posterior rib margins have been classically associated with coarctation of the aorta but other conditions can also produce this, namely, tetralogy of Fallot and pulmonary stenosis, aortic valvular disease and stenosis with hypertension, collateral dilated venous aneurysmal channels and similar arterial channels, neurofibromas, and certain nonspecific inflammatory reactions. Osteomyelitis of a rib may be primary or secondary in

origin. Usually, the infectious process is initially pulmonary and is followed by pleuritis and empyema. Periostitis develops and is followed by rib destruction. Aneurysmal dilatation of the aorta most frequently involves a contiguous vertebra by erosion but occasionally an anteriorly situated aneurysm may erode a rib or the sternum. Certain congenital malformations must also be considered in the differential diagnosis, such as osteogenesis imperfecta.

—*Sheldon Oscar Burman, M.D.*

Preblastomas of the Mammary Gland with Special Attention to Cystic Disease (Die Praeblastomatosen der Brustdruese mit besonderer Ruecksicht auf die Mastopathia cystica). I. DEGRELL, Z. SZABÓ, and F. GÁBOR. *Zbl. Chir.*, 1958, 83: 307.

TODAY no one doubts that the successful treatment of cancer of the breast depends upon its early recognition. However, most patients still consult a physician too late. Sometimes, e.g., in certain cases of cystic disease, the swelling even decreases after menstruation and the patient neglects to see a doctor at all. For this reason, systematic examinations in villages, industrial organizations, and colleges are important and organized co-operation among the doctors in the social insurance institutions, hospitals, and clinics is most important.

In Pécs systematic examination of the inhabitants for cancer is already in progress. A total of 359 school girls 16 to 20 years of age were examined. In 11 girls a definite swelling in the breast was found. There were 8 cases of fibromatosis, 2 of fibroadenoma phylloides, and 1 of fibroadenoma phylloides with intraductal papilloma. It is intended to extend the examinations to the different factories of Pécs.

The authors report a 2 year study of the surgical-oncologic activity of the Social Insurance Institute and of the Second Surgical University Clinic of Pécs. This study is concerned with the theoretical and practical prevention and treatment of blastomatic disease of the mammary gland. Cooperating in this study are the Institute for Pathological Anatomy and the Gynecological University Clinic. The report covers the treatment of 104 patients in whom a swelling in the mammary gland was found.

In fibromatosis mammae an irregular swelling surrounded by a capsule is found in the mammary gland, sometimes blending with the substance of the gland. It is about the size of a nut or a hen's egg and causes neither local nor general discomfort. Fibromatosis is important because of its precancerous possibility. It usually occurs in younger persons, the average age being 24 years. There were 19 such cases in this series.

Fibroadenoma mammae is the most common breast tumor. It is surrounded by a capsule, is easily movable, and grows slowly. According to the literature, 13 to 15 per cent of these tumors develop into carcinoma. Thirty cases were found in this series.

There were 28 cases of cystic disease in this series. It occurs most frequently at 35 to 45 years of age and seldom occurs after 50 years. The most frequent complaint was mastodynia and a tense feeling that sometimes became an unbearable pain, especially in the premenstrual period. Biopsy revealed fibrous hyperplasia of the interlobular connective tissue. In most patients there were insomnia, increased irritation, headaches, hysterical reactions, and dermographia.

Most of the operations were done under local anesthesia and left very little scarring. The wound was drained for 24 hours. There was no infection nor other disturbance of wound healing.

Macroscopically, three types could be distinguished: (1) those which showed a predominant diffuse fibromatosis, (2) those that showed, in addition, various sized cysts, and (3) those in whom cysts predominated. Histologically, in the first type there was an increase of the interlobular connective tissue. In the second type, in a groundwork of diffuse fibrosis, enlarged cystic glands were found which contained a rich eosinophilic epithelium. In the last group, the cystically enlarged gland lumina were in two or three rows with characteristic changes having the appearance of intraductal proliferation of epithelial cells. Cases illustrating these three types are cited.

In the literature cystic disease is considered the most important preblastomatous condition of the mammary gland. In the 104 cases of breast tumor there were 17 cases of breast carcinoma of which 8, or more than 40 per cent, had formed on the basis of cystic disease. Three cases illustrating this condition are cited.

In addition to operative treatment, the results of hormonal treatment must also be considered. In 14 cases that were clinically diagnosed as cystic disease, anatomic and cytologic examination of "curettings" showed an overproduction of follicular hormone. These patients were given premenstrual intramuscular injections of progesterol for 3 to 5 months. In 70 per cent, a completely symptom-free condition resulted. In 2 patients there was no improvement. In 2 other patients, biopsy before and after treatment showed regressive changes in the latter.

Precarcinomatous conditions can best be found by biopsy or excision of the tumor as illustrated in a cited case. Lymphoid cell infiltration is a rare condition; a case is described. Clinically, it somewhat resembles Paget's disease, but histologically it shows none of the changes of this condition.

—*Alfred H. Noehren, M.D.*

Radiation Therapy of Cancer of the Breast (Die Strahlenbehandlung des Mammakarzinoms). HEINZ VIETEN. *Deut. med. Wschr.*, 1958, 83: 545.

IN MAMMARY CARCINOMA, the aim of both surgery and irradiation is to rid the body of cancer cells. Cancer of the breast is only moderately radiosensitive. Sensitivity varies with the histologic type. The more highly differentiated adenocarcinomas are the least sensitive. Metastases are less sensitive than the primary tumor. Many factors, including inflammation, degeneration, and scarring, affect radiosensitivity, usually increasing resistance. This increased resistance to irradiation is especially apparent with the inflammation, edema, and scarring following surgery.

Time relationships are of the utmost importance in the combined surgical and radiation therapy of breast cancer. The author believes that radiation treatment alone is not indicated for operable lesions, except under very unusual circumstances. Prophylactic postoperative irradiation with moderate doses is purposeless. If no tumor cells escaped the surgeon, radiation therapy

is not needed. If variable cancer remains, moderate doses are inadequate. Therapeutic postoperative irradiation should include the entire lymph drainage system of the breast, and additional higher doses should be directed at suspicious areas. Such postoperative treatment improves the results produced by surgery alone very slightly. Patients treated in this manner who do least well are those in whom the axilla and supraclavicular space were dissected. Because the tissue changes produced by surgery decrease the effect of radiation on the tumor, various forms of therapy, ranging from radiation therapy alone through excision of the tumor or of the breast followed by radiation to modified radical operations in which the axilla is attacked only superficially, have been advocated. The author believes that radical mastectomy remains the primary form of therapy for cancer of the breast, but that the more inaccessible lymphatics, especially in the supraclavicular space, should be left undisturbed, to be treated by intensive irradiation if it proves necessary.

Preoperative irradiation, using curative doses directed especially at the primary neoplasm and palpable metastases, seems more purposeful than postoperative therapy. The most reasonable treatment may well be that which combines preoperative and postoperative irradiation. Two thousand roentgens are given preoperatively, followed in 3 to 4 weeks by surgery. As soon as the sutures are removed irradiation is continued with an additional 2,000 roentgens and, at intervals of 3 months, one or two more series of 2,000 roentgens. Preliminary irradiation to the undisturbed, hence presumably most sensitive, tumor serves the purpose of devitalizing the growth and preventing spontaneous and operative spread. In combination with the additional postoperative therapy, sufficient dosage is reached to eradicate residual cancer. In a collected series of 1,680 cases, the 10 year survival of patients who were treated by surgery alone was 23.0 per cent; with postoperative irradiation, 26.7 per cent; and, with preoperative radiation therapy in addition, 31.0 per cent.

To await biopsy diagnosis before beginning preoperative irradiation is to pose a contradiction in terms. The author believes that radiation therapy should be instituted prior to surgery in those cases which are unequivocally carcinoma in the opinion of both the radiologist and the surgeon who will subsequently operate. If a histologic diagnosis is necessary for the decision, frozen section technique should be used and, if the lesion proves to be a cancer, mastectomy should be performed immediately.

—Elmer V. Dahl, M.D.

Surgical and Hormonal Treatment of Breast Cancer (Die chirurgische und hormonelle Behandlung des Mammakarzinoms). M. SCHWAIGER. *Deut. med. Wschr.*, 1958, 83: 540.

CONVENTIONAL RADICAL MASTECTOMY remains the standard approach to the treatment of mammary carcinoma. Radical mastectomy is useful as definitive treatment and also as palliative surgery except when contraindicated by massive infiltration of the axilla, carcinomatous pleuritis, or generalized metastases. The results of simple mastectomy combined with intensive irradiation have already been shown to be inferior in terms of 5 year survivals.

Extended, ultraradical surgical procedures do not seem justified. When the supraclavicular or parasternal lymph nodes contain metastases, it is unlikely that any operation can be sufficiently radical for total extirpation of the neoplasm, and the pertinent areas are best left intact, to derive the full effect of intensive irradiation. Thirty per cent of patients whose cancer seems clinically to be limited to the breast, and whose axillary lymph nodes are histologically free of tumor, are subsequently found to have metastases. For purposes of treatment, it might be well to discount the concept of carcinoma limited to the breast, and to treat all such patients by irradiation following radical mastectomy.

If preoperative irradiation is used, it should not cause long postponement of surgery. Such therapy requires close liaison between the surgeon and the radiologist. No surgeon can be expected to perform a radical mastectomy on a patient who, following radiation therapy, has no palpable tumor, and for whom no histologic diagnosis of cancer of the breast exists. Unless the diagnosis of mammary carcinoma is unequivocal, biopsy should be accomplished with the patient under general anesthesia, and radical mastectomy should be performed immediately if frozen sections prove the tumor to be malignant.

Manipulation of the endocrine milieu in patients with breast cancer had its origin in the observation that such tumors are often relatively benign in the aged, behave more aggressively during the reproductive years, and are catastrophic during pregnancy. Surgical castration is preferable to irradiation of the ovaries; the cessation of estrogen production is prompt and positive in the former. Castration is reasonable only during the reproductive period and during the first few years following the menopause. The administration of androgens is the second step in hormone therapy. In women of child-bearing age this should always be combined with ovariectomy. In 30 per cent of the patients there are temporary remissions, followed in 2 to 3 years by reactivation of the neoplasm and rapid deterioration of the patient.

Bilateral adrenalectomy in women between 40 and 65 years of age, in whom ovariectomy and administered androgens were temporarily effective, whose breast cancer is relatively well differentiated, and whose urinary excretion of estrogens, corticoids, and 17-ketosteroids is high, will again produce remissions in about half of the patients who meet these narrow conditions. Paradoxically, estrogen therapy benefits 50 to 60 per cent of postmenopausal patients with metastatic cancer of the breast. It may be used in early postmenopausal patients after androgen therapy has failed, and is used as primary therapy in the elderly. Its effects may be observed on soft tissue metastases as well as on metastases to bone. Once begun, hormone therapy must be continuous. Not only is the amelioration of symptoms lost on cessation of therapy, but there is an actual rebound phenomenon.

Both estrogens and androgens depress pituitary trophic hormone production, and the temporary nature of their effect may be explained on the basis of resumed anterior pituitary function in the presence of

prolonged high blood levels of the sex hormones. Hypophysectomy is a major procedure which may be quite impossible in seriously ill patients for whom this final procedure may be indicated. In contrast, the transethmoidal insertion of segments of radioactive gold wire, the dose and position of which may be accurately controlled, is suitable even for the desperately ill. The operation takes only 8 to 10 minutes. Pituitary function diminishes gradually, obviating the substitution therapy which is necessary after conventional hypophysectomy. There were no operative deaths in a series of 199 patients treated in this manner with Au^{198}. Results are sometimes astonishing: reconstruction and recalcification of bone lesions, disappearance of pain, weight gain, and the like. The simplicity of this "percutaneous hypophysectomy," as well as its results, suggests that in the future the method may be found useful also in less advanced metastatic disease, and that it may replace adrenalectomy and even exogenous hormone administration.

Despite advances in therapy, early diagnosis remains the critical factor for the achievement of significant increases in survival rates.

—Elmer V. Dahl, M.D.

Adrenolienal Shunt for Metastatic Cancer of the Breast (Adreno-lienaler Shunt beim metastasierenden Mammakarzinom). A. WALSER, W. HESS, A. L. MEIER, and P. SPRING. *Deut. med. Wschr.*, 1958, 83: 580.

THE AUTHORS report the cases of 6 patients with metastatic cancer of the breast in whom an adrenolienal shunt was constructed. In many women with breast cancer, the reduction of circulating estrogens by castration is followed by regression of both the tumor and its metastases. Urinary estrogens disappear completely only after the adrenal glands are also extirpated, and 40 per cent of patients with mammary carcinoma present subjective and objective evidence of tumor remission following adrenalectomy. Because total adrenalectomy necessitates continuing substitution therapy, and because there is evidence that the liver inactivates circulating estrogens, methods for shunting blood from the adrenals to the liver have been investigated. One of these methods is by adrenolienal shunt, leading blood from the adrenal gland to the portal circulation instead of the renal vein and thence to the vena cava.

Several weeks prior to the shunt operation, the authors performed a right adrenalectomy and, if the ovaries had not been removed previously, a bilateral ovariectomy. For the shunt procedure, a transthoracic approach through the left eighth intercostal space was used. The spleen and tail of the pancreas were mobilized, the splenic artery was doubly ligated, and the splenic vein was ligated and divided. The spleen was temporarily retained for retraction. The suprarenal vein was ligated near its entry into the renal vein, and any accessory suprarenal veins were ligated. End-to-end anastomosis of the suprarenal vein and the splenic vein was carefully accomplished using interrupted sutures of No. 00000 silk, and the spleen was removed. Cortisone was administered during surgery and for 9 days after operation. Hormone therapy was then withheld, and the patient's adrenal function was tested by determination of urinary 17-hydroxycorticoids and 17-ketosteroids, both at rest and after ACTH stimulation.

The adrenal functioned adequately after operation in 5 of the 6 patients. In one patient, whose adrenolienal shunt had been constructed over a retained polyvinyl tube, clinical and laboratory signs of adrenal failure developed. The presumption that thrombosis of the shunt had occurred was confirmed at autopsy. In 2 others upon whom autopsy was performed the major part of the venous blood from the adrenal had been successfully diverted to the portal circulation, as indicated by postmortem injection studies. Thrombosis with minor recanalization of the shunt was found at autopsy in one patient, in whom the major part of the adrenal blood was carried to the renal vein by adrenal capsular veins. No autopsy was performed on one patient, and one patient remains alive and in remission 13 months after operation.

The reported series is too small to permit comparison of the results with those following total adrenalectomy. In all 6 patients the operation was considered beneficial. Five patients lived for periods of 6 to 13 months after operation. The sixth patient, who had extensive osteolytic and osteoblastic metastases to many bones at the time of construction of the adrenolienal shunt, is alive and active 13 months later. The periods of remission in the 6 patients are shorter than those reported following adrenalectomy, but the patients were not dependent on substitution therapy during that time. "Medical adrenalectomy" with large doses of cortisone or prednisone was performed terminally, and produced only short periods of subjective improvement.

—Elmer V. Dahl, M.D.

TRACHEA, LUNGS, AND PLEURA

Selective Angiography of the Lungs in Normal and Pathologic Conditions (Die selektive Angiographie der Lunge unter normalen und pathologischen Verhaeltnissen). R. SEMISCH, H. KÖLLING, and H. H. WITTIG. *Zbl. Chir.*, 1958, 83: 469.

KNOWLEDGE OF THE FUNCTIONAL CAPACITY and reserve of the lungs, the heart, and the entire lesser circulation is critically important in the preoperative evaluation of patients for pulmonary surgery. Although the respiratory parenchyma may be reduced to one-third of the normal and still support life, reduction of the vasculature of the lesser circulation to that degree eventually leads to failure of the right side of the heart. Quantitative preoperative analysis of reduction of the pulmonary vascular reserve, with reference to the pre-existing chronic cor pulmonale, as well as to the contemplated additional surgical reduction of vascular reserve, is desirable. Half of the operative and postoperative deaths following pulmonary resection are due to unrecognized cor pulmonale. Present diagnostic methods are not adequate for the evaluation of the lesser circulation.

Ideally, knowledge of the right ventricular reserve would be gained by measuring the increased intraventricular pressure subsequent to an increase in the cardiac work load. Technically, such determinations are dangerous and inaccurate. Selective pulmonary angiography—the visualization of portions of the pulmonary circulation by means of contrast media

injected through a catheter—provides useful information for the evaluation of the lesser circulation. Even when pulmonary arterial pressure at rest is normal, angiographically visible abnormalities may provide a basis for estimating reduction of the pulmonary vascular reserve. The information gained may be used both for delineating diseased and healthy portions of the lungs, and also for estimating the vascular functional capacity after performance of the contemplated surgical procedure.

Normally, the medium and small pulmonary arteries are mildly tortuous during expiration, and slightly stretched during inspiration. Their caliber remains unchanged during the respiratory cycle. The angle of origin of branches is less than 60 degrees, and reduction of the arterial size toward the periphery is gradual. Angiographically visible abnormalities include vascular narrowing, increase in the angle of origin of the branches, decreased circulation time (as indicated by progression of the contrast medium), abrupt arterial termination, rarefaction of the peripheral vascular network, and alterations in topography. By utilization of criteria based on these abnormalities, it is possible to define the boundaries of emphysematous areas and the extent of pulmonary expansion or over-expansion following previous resection, to determine areas of reversible and irreversible atelectasis, and to visualize vascular stenosis and the areas of partial and complete arterial obliteration.

The salient angiographic features of emphysema include elongation and spreading apart of the arterial branches with an increase in their angle of origin, diminished subsegmental markings, delayed passage of the contrast medium through segmental and subsegmental arteries, narrowing of the peripheral arteries, and inability to demonstrate a capillary filling phase. Atelectasis is recognized angiographically by generalized arterial narrowing in the involved parts of the lung, by a crowding together of the vasculature, with decrease of the angle of origin of the branches, and by a poorly visualized precapillary arterial network. Reversible and irreversible atelectasis may be distinguished by the presence of a capillary filling phase in the former. Regions of pulmonary parenchymal destruction may be distinguished as areas of arterial obliteration, with narrowing and bizarre distortion of the remaining vessels.

—*Elmer V. Dahl, M.D.*

The Value of Angiopneumography in the Functional Diagnosis of Pulmonary Diseases (Il valore della angiopneumografia nella diagnostica funzionale delle malattie pulmonari). Lino Nelli, Piero Pietri, and M. Reich. *Chir. torac.*, 1957, 10: 236.

In evaluating the relative merits of angiopneumography and bronchospirometry in the diagnosis of a variety of pulmonary diseases, the authors made an attempt to answer these basic questions: (1) Is angiopneumography a reliable method of evaluation of respiratory function? (2) What are the practical advantages of this method when compared to bronchospirometry? (3) Are there some characteristic aspects of angiopneumography which could make it, in some instances, preferable to bronchospirometry?

The group of patients studied with both methods at the Institute of Surgical Pathology of the University of Milan included 33 cases of benign and malignant lung tumors, 23 cases of lung abscess, 8 cases of pulmonary tuberculosis with cavitation, 4 cases of empyema (2 of them with pneumohydrothorax), 5 cases of bronchiectasis, and 6 miscellaneous cases. Bronchospirometric studies were performed, according to standard methods, using pure oxygen. The angiographic method consisted of a manual injection into the antecubital veins or the external jugular veins of a 70 per cent solution of ioduron or acetiodone using a 3 mm. needle. The amount of opaque material injected varied from 0.75 to 1.0 c.c./kgm. of body weight. Serial films were obtained at one second intervals beginning one second after injection.

In bronchial stenosis, in which the vascular design may be partially or totally absent according to the degree of atelectasis, functional evaluation was not difficult although angiography did not add much to the impression gained by plain fluorograms of the chest. In the syndrome of hypoventilation, however, the method was of value in demonstrating thinning of the arterial tree and reduction of the vascular design, and in estimating the extent of the area of hypoventilation. Angiopneumography was also of particular value in the study of primary and secondary vascular lesions by showing a frequent discrepancy between ventilation and oxygen consumption.

Parenchymal lesions, regardless of etiology, may show the same functional disturbance, namely partial or total exclusion of sections of parenchyma from respiratory function. In patients with cavitation and fibrosis of tuberculous etiology, angiopneumograms showed marked reduction or absence of the vascular pattern around the zones of cavitation; the extent of the vascular involvement was a basic element in formulating an estimate of the pulmonary functional deficit. Angiographic estimations seemed to correlate well with bronchospirometric data. The experience with instances of chronic pulmonary abscess was similarly interesting in defining the extent of the vascular changes, sometimes involving the entire lobe, site of the cavitating lesion. The diagnostic value of angiopneumography in the study of bronchiectasis is stressed by the authors because they were able to establish a valuable correlation between anatomical and vascular changes. The anatomical changes were generally more extensive than bronchospirometry led one to believe.

A final analysis of the results obtained by both methods indicated that a considerable discrepancy between bronchospirometric and angiopneumographic findings existed in only 6 cases. In 21 cases the discrepancy was less than 10 per cent and in 45 cases the results were practically identical.

The authors conclude that angiopneumography has limitations as a method of study of respiratory function. It is a qualitative rather than quantitative method and therefore subject to individual errors of interpretation. The value of the method is mainly in the possibility offered by angiopneumography to clearly define the topography and the extent of certain lesions and to offer valuable information to the surgeon.

—*Franco Sangalli, M.D.*

FIG. 1 (Bolt, Rink). Subsegmental angiogram in primary pulmonary arteriosclerosis.

Studies on the Regional Analysis of Pulmonary Ventilation and Pulmonary Circulation; Employment of Isotope Thoracography and Selective Pulmonary Angiography (Studien zur regionalen Analyse der Lungenventilation und Lungenzirkulation; mittels der Isotopenthorakographie und der selektiven Lungenangiographie). W. BOLT and H. RINK. *Thoraxchirurgie*, 1958, 5: 379.

CURRENT TECHNIQUES available for the study of pulmonary ventilation include spirometry, bronchospirometry, and pulmonary lobe spirometry. The latter two require bronchoscopy and the information gained from such procedures is often representative of only partial function of the area being studied. In order to overcome these drawbacks, Knipping, Bolt, Valentin, and Venrath of the University of Cologne developed the technique of isotope thoracography. This involves the respiration of radioactive xenon 133 (a gamma-emitter with a half-life of 5.7 days) by the patient. The ventilated gas is then measured by means of Geiger-Mueller tubes on the surface of the thorax. Sixteen to sixty-four tubes may be employed and symmetrical and simultaneous readings obtained. Since xenon is an inert material, it does not enter into chemical combinations with body constituents. By having the subject breathe inactive xenon prior to using the radioactive isotope, the tissues become saturated with this material and none is absorbed by diffusion. The amount used is small and completely expired.

Utilizing this technique, it is possible to detect partial functional deficiencies of the lung that are due to changes in the parenchyma, i.e., tumors, atelectasis, segmental and lobar destruction of various etiologies, and bronchopulmonary fistulas.

Another approach which may be employed in evaluating pulmonary function is selective pulmonary angiography. Visualization of both the arterial and capillary phases can provide valuable information on morphologic and functional changes. In studying the v. Euler-Liljestrand-Cournand effect (increase in pulmonary artery pressure during hypoxia), changes could not be observed in the pulmonary arteriogram. One may therefore conclude that this phenomenon is caused by changes in the smaller peripheral arterioles. The authors' experience with this technique has led to these conclusions:

1. Complete and partial atelectasis of reversible and irreversible character can be differentiated on the basis of the angiogram. When a clear-cut capillary phase can be visualized in the involved area, the process is of a reversible nature. Pulmonary parenchymal destruction results in a prolonged arterial phase and characteristic changes in the angiogram, e.g., vascular deformities, narrowing, and obstruction.
2. A generalized deformity of the vascular pattern in a segment, or subsegment, is indicative of a process resulting in atrophy of the parenchyma, e.g., pulmonary cysts.
3. Essential (or senile) emphysema is characterized by a generalized diffuse decrease in the vascular system, especially in the periphery of the lung. The capillary phase is also difficult to visualize.
4. Morphologic abnormalities, such as nodules, show destruction of the vessels in this area and atrophic changes in the surrounding parenchyma.
5. Primary arterial disease, such as pulmonary arteriosclerosis, has a characteristic and diagnostic appearance. The vessels are seen to narrow markedly and suddenly as they proceed to the periphery (Fig. 1).

—*J. C. Rosenberg, M.D.*

End Results of Pulmonary Resection for Tuberculosis. JULIAN A. MOORE, HARRY E. WALKUP, JOHN E. RAYL, and JESSE P. CHAPMAN, JR. *Ann. Surg.*, 1958, 147: 659.

THE AUTHORS evaluate the end results of pulmonary resection used in conjunction with antimicrobial drugs in the treatment of pulmonary tuberculosis, during a 10 year period from January 1, 1947, to January 1, 1957. During this period 1,130 pulmonary resections were carried out on 1,080 patients. The records of 894 of the 960 surviving patients (93 per cent) were available for follow-up study.

During the past decade the management of pulmonary tuberculosis has changed from treatment with bed rest and collapse to treatment with antimicrobial drugs, pulmonary resection, and occasionally thoracoplasty. The early resections for tuberculosis carried out in the decade from 1937 to 1947 were attended with a high rate of morbidity and mortality, but in 1947, a study of the efficacy of streptomycin as a protective agent during pulmonary resection revealed such a marked diminution in morbidity and mortality that pulmonary resection

soon became the operation of choice as an adjunct in the treatment of pulmonary tuberculosis. The use of streptomycin and other potent drugs for the treatment of tuberculosis has reduced the mortality rate about 80 per cent in the past decade. At the present time the most frequent indication for excisional surgery consists of patients who are classed as failures of antimicrobial therapy. The study revealed that, during the decade reported on, the use of these drugs in various combinations has tended toward longer and longer periods of time both preoperatively and postoperatively.

The authors discuss the complications of pulmonary resection correlated with the type of resection. There were no complications in 318 segmental resections; bronchopleural fistula and/or empyema developed in 9 per cent, early spread in 2 per cent, and miscellaneous complications in 28 per cent. Of the 398 patients with lobectomies bronchopleural fistula and/or empyema developed in 11 per cent, and of the 67 who had lobectomy plus segmental lobectomy bronchopleural fistula and/or empyema developed in 28 per cent. Of the 284 with pneumonectomies bronchopleural fistula and/or empyema developed in 24 per cent.

The incidence of tuberculous spread following primary resections was considered surprisingly low. It varied from 0 to 10 per cent in the various types of operations performed. The majority of cases of fistula and/or empyema mentioned developed during the earlier years of this study and suggest a need for longer periods of antimicrobial therapy both preoperatively and postoperatively. Late reactivations of tuberculosis were seen in 8 per cent of the primary pulmonary resections. A trend toward fewer reactivations is suggested in the patients receiving longer periods of antimicrobial therapy. The mortality figures varied from 5 per cent for cases of segmental resection to 20 per cent for the pneumonectomy cases. This figure represented both tuberculous and nontuberculous deaths both early and late. A correlation was also made between mortality and drug duration but no significant relationship was demonstrated.

The ultimate result of the excisional procedures and the type of resection performed were compared and follow-up data were obtained in 93 per cent of surviving patients; 90 per cent of them had inactive tuberculosis. Of those patients who survived a lobectomy plus a segmental lobectomy 22 per cent who were traced still had active tuberculosis.

The over-all results of pulmonary resection for tuberculosis in the total resection series revealed that 75 per cent of the 1,067 patients are living without active tuberculosis, but only 58 per cent are carrying out a gainful occupation. An over-all mortality rate of 10 per cent is noteworthy.

The effects of the chemotherapeutic agents for tuberculosis are far-reaching. Many patients with advanced disease become entirely well and extrapulmonary lesions are less frequently seen. However, there are still a considerable number of patients who do not get entirely well and who are left with open cavities and large residual caseous nodules. They eventually develop resistance to all drugs and many will suffer a relapse. It is this group of patients who are presented to the surgeon for salvage. The authors are of the opinion that there is an optimum time for the performance of pulmonary resection on the tuberculous patient. If after 6 months of drug therapy, cavities have not closed and large caseous nodules have not resolved, these patients should be seen by the surgeon for consultation to determine when and if a resection should be performed. At this time a decision must be made as to whether the hazards of resection, which are real, are less than the hazards of continued drug therapy, which are also real. It is interesting to note that the authors are returning to thoracoplasty as the operation of choice in drug resistant patients who have residual cavities which are in good locations for this type of collapse therapy.

—*Donald M. Clough, M.D.*

Pulmonary Histoplasmosis. GERALD L. BAUM and JAN SCHWARZ. *N. England J. M.*, 1958, 258: 677.

HISTOPLASMOSIS, a generalized fungous disease that begins in the lungs, is world-wide in distribution but is endemic chiefly in the Mississippi Valley of the United States where the organism, Histoplasma capsulatum, exists in the soil. The inhalation of the spores initiates the infection. A small area of bronchopneumonia, usually single, develops, becomes granulomatous, and central caseation may develop. The regional lymph nodes are invaded early, and together with the primary focus, form the primary complex. Early hematogenic dissemination occurs commonly, probably at the time of the primary infection. The primary infection is almost always benign, asymptomatic, and self-limited; occasionally symptomatic cases are seen. Healing and calcification of the primary complex usually result. The calcification is characteristically large and stippled. Multiple small calcific densities, which are also seen typically, result from hematogenous pulmonary infection.

The skin test becomes positive within 2 or 3 weeks after infection and it remains so for a considerable but undetermined length of time. It may disappear after the age of 40, especially in females. The complement fixation test usually becomes negative after the acute infection subsides but a positive test may remain for many months. In young children the hazard of active lethal dissemination is greater than among the older age groups. In clinically well people occasionally a routine chest roentgenogram will reveal a definite peripheral infiltrate. In the Mississippi Valley the infiltrates most commonly are not tuberculosis but histoplasmosis. This also is the etiology of many "coin lesions" which are usually self-limiting.

There is a high attack rate in populations such as troops moved to an endemic area, but early clinical recovery is the rule. Indeed, the great majority of pulmonary lesions heal completely and permanently. When cavitary disease occurs it is often indistinguishable from tuberculosis. Marked anemia and eosinophilia with counts of 3 to 5 per cent are common. In cavitary cases the sputum or gastric washings or both are often positive on culture for Histoplasma capsulatum. Thus far, person-to-person transmission of histoplasmosis has not been proved. However, 9 out of 10 primary infections are completely asymptomatic. Cavitary histoplasmosis has a poor prognosis. If un-

treated, patients slowly deteriorate and die of progressive involvement. The use of amphotericin B promises to improve the prognosis in this disease. Bronchiectasis, transtracheal perforation by involved nodes, and compression phenomena have all been reported. In a young person who does not smoke and whose lesion shows calcification, a conservative approach seems warranted. Evidence of growth, cavitation, or strong suspicion of cancer indicates resection. Because of the frequency of satellite lesions resection should consist of something more than shelling-out of the coin lesion. —*Sheldon Oscar Burman, M.D.*

Traumatic Pulmonary Hematoma (Hématomes pulmonaires traumatiques). A. BALMES and A. THÉVENET. *Poumon*, 1958, 14: 113.

THE AUTHORS described a case of posttraumatic pulmonary hematoma presenting as a rounded roentgen opacity. The symptomatology was reviewed and the authors thought that exploratory thoracotomy was indicated in the absence of regression in from 4 to 6 months.

They believe that it should perhaps be pointed out that trauma may be associated with the first roentgenogram of a patient. Under these circumstances one may be dealing with a coin lesion and an incidental diagnosis. The condition may also be hemoptysis or a true pulmonary cancer. Under the circumstances it is thought that a rather more rapid approach to surgery is indicated. —*Roger H. L. Wilson, M.D.*

Neoplastic Cells in the Peripheral Arterial Blood of Patients with Bronchiogenic Carcinomas (Cellule neoplastiche nel sangue arterioso periferico di portatori di cancro bronchiale). C. COLOMBO, G. MAGGI, and F. ROLFO. *Minerva med.*, Tor., 1958, 49: 725.

IN A SERIES of 13 patients with bronchiogenic carcinoma, the peripheral arterial blood was examined for tumor cells. The blood was drawn, lysed with distilled water, and centrifuged. Serial sections were made of the residue; they were stained and examined for tumor cells.

From their experiences, the authors conclude that the tumor cells are found more frequently in the venous blood that drains the tumor site. They are seen rarely in the peripheral venous circulation. Surgical trauma does not influence the mobilization of tumor cells. Tumor cells are found more frequently in the more anaplastic tumors. —*Roland A. Manfredi, M.D.*

Björk's Thoracoplasty Complementing Pulmonary Resection (La thoracoplastie de Björk, complément des résections pulmonaires). F. LANTIN. *Acta. chir. belg.*, 1957, 56: 939.

SINCE 1955 the author has adopted the roof thoracoplasty of Björk to complement resection for tuberculosis of more than one lobe, and whenever potentially active nodules are present in the remaining lung parenchyma. The procedure effectively reduces the volume of the thoracic cavity, and effects a proper balance between the expansion capacity of the remaining parenchyma and the chest wall without compromise of the mechanisms of respiration of the opposite lung. The technique is described minutely and illustrated in 3 line drawings.

This report describes the results obtained in 15 cases. Each constituted a problem of management because of disseminating disease, contralateral spread, or antibiotic resistance of the tubercle bacilli. One patient had involvement of both apices. After prolonged antibiotic therapy the least involved (right superior) lobe was successfully removed, followed by superior lobectomy and interior apical segmentectomy on the left side. A thoracoplasty completed the resection. Three patients had residual lesions following thoracoplasty, and roof thoracoplasty was successful.

All but 2 of the 15 patients responded favorably after operation, in one patient an anesthetic accident was lethal, and in another patient with drug-resistant extensive cavitary disease and pyothorax a bronchial fistula developed.

The author lists as the principal indications for roof thoracoplasty: (1) resection of a large mass of pulmonary tissue and threat of residual cavity postoperatively, (2) nodules in distant lung parenchyma which may become active later, and (3) patients with drug-resistant infections in whom total re-expansion is deemed necessary in order to avoid complications. The author concludes from his experiences that Björk's (roof) thoracoplasty is the only procedure that effectively reduces the dimensions of the thoracic cavity and permits a modeling of the thoracic wall around the residual lesions.

—*Edwin J. Pulaski, M.D.*

HEART AND PERICARDIUM

An Experimental Study of the Effect of Mechanically Induced Ischemia upon the Mammary Coronary Anastomoses. EDWARD R. DUCHESNE and ARTHUR VINEBERG. *Surgery*, 1958, 43: 837.

IN ORDER TO test the proportion of successful internal mammary artery "anastomoses" into the myocardium of the left ventricle and the vascular bed of that ventricle as judged by the effect upon ischemia, myocardial ischemia was mechanically induced. In order to achieve gradual constriction of the coronary arteries, stainless steel jackets with an inner lining of a hygroscopic plastic called ameroid were placed at the origin of the coronary arteries. When the ameroid is coated with vaseline, the rate of swelling is slowed down sufficiently so that a relatively predictable long term gradual constriction can be attained. These jackets were placed at the origins of the anterior descending and circumflex branches of the left coronary artery. Critical levels of closure were obtained in from 3 to 28 weeks. At this point, if the dogs exercised themselves vigorously death would result. Section demonstrated narrowing at the point of jacketing and also varying degrees of thrombosis within the lumen. After death, the animals were studied by injection with the Schlesinger mass. The jacketing procedure was then carried out on a series of animals in which internal mammary implantation was also done. These animals succumbed at varying intervals in a manner similar to the controls. Reoperation was performed on animals surviving 20 weeks and the implants found to be patent and pulsating. In general it appeared that those animals surviving for longer periods of time had a larger

proportion of anastomoses between the internal mammary artery and the coronaries as shown by injection mass studies. On these criteria there were 85 per cent successful anastomoses. The authors also call attention to the hazard of having an area supplied with well oxygenated blood adjacent to an area of damaged and poorly supplied myocardium, thus leading to electrical instability and the possibility of "mechanism failure." —*Hermes C. Grillo, M.D.*

Surgical Aspects of Chronic Constrictive Pericarditis; A Review of 72 Operative Cases. JACK C. COOLEY, O. THERON CLAGETT, and JOHN W. KIRKLIN. *Ann. Surg.*, 1958, 147: 488.

MUCH PROGRESS has been made in the past three decades in the treatment of chronic pericardial constriction. Surgical decortication is the treatment of choice, and a review of 72 cases of pericardial constriction in which operation was performed at the Mayo Clinic in the 21 years ending with 1955 reveals that excellent operative results can be anticipated in this disease. It is encouraging that among the 28 patients undergoing pericardiectomy after 1950 only three operative deaths have occurred, and 24 of the remaining 25 patients have had good results.

Mitral Insufficiency; Its Quantitation by Cardiac Ventriculography. RICHARD A. GILMAN, J. STAUFFER LEHMAN, BENJAMIN G. MUSSER, and RICHARD RUSSELL. *J. Am. M. Ass.*, 1958, 166: 2124.

THE NEED for an accurate clinical method for quantitation of mitral regurgitation has long been recognized and has been an elusive problem. Anatomic changes present in the mitral valve leaflets that induce regurgitation may preclude successful mitral valvular mobilization. Although catheterization of the left side of the heart has proved of inestimable value in the diagnosis of mitral and aortic stenosis, it has not been adequate in the evaluation of mitral regurgitation. Cardiac ventriculography has provided a more accurate means of objective assessment of the presence and degree of mitral valvular insufficiency. Cardiac ventriculography is also an effective means for evaluating the efficacy of surgical procedures designed for correction of mitral insufficiency.

The purpose of the present report is to describe experience in the estimation of mitral insufficiency by cardiac ventriculography and to present observations as to the correlation of the ventriculographic quantitation of mitral insufficiency with the operative findings at the time of surgical exploration of the mitral valve.

The technique of cardiac ventricular puncture and radiologic visualization of the ventricular chambers is not presented in this article but the reader is referred to a previous publication by two of these authors. Eighty-six patients had a satisfactory cardiac ventriculography study specifically for the determination of the presence or absence of mitral valvular regurgitation. Exploratory operations were subsequently performed on 32 of these patients and the operative findings were carefully compared with the preoperative determinations.

It is to be noted that any degree of regurgitant opacification of the left atrium was considered significant of mitral valvular insufficiency since it has been the observation of these authors from animal experimentation that the competent mitral valve will not permit of regurgitant opacification of the left atrium under the conditions of cardiac ventriculography as employed by them.

Of the 32 patients having both satisfactory preoperative studies and operative investigation, a very accurate correlation was found in all cases. Four of the patients in whom no reflux was demonstrated with the preoperative x-ray studies were found to have pure mitral stenosis without any mitral regurgitation at the time of operation. Of the remaining 28 patients whose preoperative roentgenograms revealed reflux, some amount of regurgitation was found at the operating table in all cases.

—*Matthew H. Evoy, M.D.*

The Surgical Correction of Mitral Insufficiency by Use of a Pericardial Valve Graft. ALVIN A. BAKST, SCOTT J. BOLEY, EDWARD JOSEPH, and LEO LOEWE. *J. Thorac. Surg.*, 1958, 35: 492.

MITRAL INCOMPETENCE in dogs was produced by resection of the posterior portion of the mural leaflet and avulsion of the chordae tendineae cordis to this site. The severity of this insufficiency resulting in rapid death due to pulmonary edema made it necessary to effect the repair immediately upon production of the regurgitation. A rectangular segment of pericardium 4 by 7 cm. was fashioned with three or more tails. In it a piece of muscle was incorporated to provide bulk to the valve. The graft was placed into the left ventricle by suture beneath the posterior commissure to the right of the posterior descending coronary artery, by a second suture in the mural leaflet between the two commissures at the junction between the leaflet and the annulus, and by a third suture midway between the two previous sutures. The final suture passed from the posterior papillary muscle to the tail of the valve graft. When fixed into position across the posterior portion of the mitral orifice the graft tamponaded the regurgitant jet but did not interfere with the function of the aortic leaflet. Autopsy studies proved the grafts to be adherent in situ with thickening of the apical chorda. Mitral insufficiency may be caused by the deficiency of tissue in the posterior portion of the mural leaflet resulting in regurgitation through the posterior commissure.

—*B. G. P. Shafiroff, M.D.*

Surgical Experiences with 100 Operations for Mitral Stenosis (Chirurgische Erfahrungen bei 100 Operierten Mitralstenosen). F. LINDER, W. SCHMITZ, H. KOCH, and H. SCHMUTZLER. *Chirurg*, 1958, 29: 152.

THE FIRST 100 CONSECUTIVE PATIENTS on whom the authors performed mitral valvulotomies consisted of 76 females and 24 males. Their ages ranged from 14 to 52 years. Eight patients were under 20 years of age, and 5 were more than 50 years old. The remaining 87 patients were nearly evenly distributed in the third, fourth, and fifth decades. According to the functional classification of the American Heart Association, 20 patients were in group 2, 71 in group 3, and 9 in group 4.

When no surgical complications were expected,

thoracotomy was performed through the fourth left intercostal space anteriorly. This approach was adequate in uncomplicated cases, and was utilized in 76 patients. In 24 patients a posterolateral thoracotomy was performed through the fifth left intercostal space, to provide wider exposure. When excessive pericardial vascularization was encountered, a small opening was made in the pericardium with scissors, and then the pericardial sac was incised with a cautery knife over an inserted plastic guide. The mitral opening was enlarged bluntly, by finger fracture, in 88 patients, and with instruments in only 12 patients. In 54 patients an adequate valve orifice of 3.5 to 4.0 sq. cm. was provided by fracture of a single commissure, usually the anterolateral one. Mild mitral insufficiency was recognized prior to commissurotomy in 17 patients. The insufficiency disappeared following surgery in 2 patients, and was unaltered in 15 patients. Mild mitral insufficiency was first apparent after enlargement of the valve aperture in an additional 12 patients. The insufficiency did not alter the surgical result in any case.

Auricular thrombi (10 old and organized, and 7 recent) were encountered in 17 of the 100 patients. Arterial embolization occurred in only one patient, a 49 year old woman who died 12 hours after operation. Five hours after valvulotomy she developed signs of a saddle embolus at the aortic bifurcation. Embolectomy was performed, and 6 hours after that there were signs of an embolus in the right femoral artery. Embolectomy was again performed, but the patient died of acute heart failure one hour later. At autopsy the emboli were thought to have arisen from postoperative thrombi on the freshly fractured mitral commissures.

Cardiac arrest and ventricular fibrillation were experienced during surgery in 5 instances. In 4 of these cases, ventricular fibrillation occurred during fracture of the posterolateral mitral commissure, and was successfully treated with the defibrillator. In a fifth case, cardiac arrest led to death during surgery of a patient with severe aortic and mitral stenosis. Tears in the auricular wall beyond the purse-string suture about the exploring finger occurred 4 times, and were successfully sutured each time. Satisfactory valvulotomies were performed on 2 patients who had had previous mitral valve surgery. In one, the first operation had produced an inadequate valvular orifice, and in the second, stenosis again followed active rheumatic fever.

There were 4 deaths during surgery and in the immediate postoperative period. One patient died because of slow bleeding from a lacerated ventricular wall, produced during instrumentation of a heavily calcified mitral valve. One patient died of massive pulmonary emboli 19 days after the operation, one died following embolectomy for aortic and femoral emboli, and one of cardiac arrest during surgery for both mitral and aortic insufficiency. Four additional deaths occurred in the year following surgery. Two of these were caused by pulmonary emboli. One death was due to pneumonia with abscess formation complicating paratyphoid fever, and in one patient rheumatic reactivation again produced mitral stenosis and led to sudden circulatory collapse.

More than 80 per cent of the patients were subjectively and objectively benefited by surgery. In 45 patients, benefit was sufficient to warrant a revision by 2 groups of their functional disability in classification according to the system of the American Heart Association. Benefit in 38 patients was sufficient for revision of their functional disability by one group. Six patients were not benefited, 8 died, and 3 could not be traced. —*Elmer V. Dahl, M.D.*

Observations on 2 Surgically Treated Cases of Tricuspid Stenosis (Beobachtungen bei 2 operierten Kranken mit Tricuspidalstenose). E. DERRA, F. GROSSE-BROCKHOFF, and F. LOOGEN. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 104.

A CONSTRICTION of the tricuspid seldom occurs as an isolated valve disorder. In the great majority of cases it is combined with valvular disorders of the aorta or of the mitral valve. This is verified by statistics from several investigators. In comparison to the frequent mitral disorders in chronic rheumatic endocarditis seen in autopsies, an accompanying tricuspid disease is seldom clinically diagnosed and seldom operated upon. The symptoms are overshadowed by those of the mitral disease and therefore are not considered important.

The recognition of tricuspid disease is of special importance for two reasons: (1) because it can be cured by operation, and (2) because an operative cure of an accompanying mitral stenosis alone does not bring the expected improvement.

Among 700 cases examined by means of the heart catheter, a narrowing of the tricuspid valve was determined in 5 cases. In 2 cases the tricuspid stenosis was isolated. In the others it was combined with a mitral and aortic stenosis. In 2 cases operative treatment of the tricuspid valve was instituted; one case was an isolated condition and the other was associated with a ventricular septum defect.

Case 1. A 28 year old woman with a history of dyspnea and cyanosis since infancy was found on examination to be a heavy woman with light cyanosis and dyspnea on exertion. A presystolic murmur was present, her blood pressure was 90/70mm. Hg and the liver was enlarged 2 to 3 fingers and pulsating. There was no edema of the legs. The suspicion of tricuspid stenosis was further strengthened by the electrocardiogram and the roentgenogram. It was confirmed by venous heart catheterization and angiocardiography.

A bilateral transpleural thoracotomy was done under hypothermia. A finger inserted into the heart palpated a smooth tricuspid apparatus, in the middle of which a small slitlike opening was found. The opening was enlarged by stretching in one direction and by cutting with a Bailey knife in the other. After closure of the heart, both ventricles contracted vigorously. Bilateral drainage of the chest was instituted.

After the operation, the patient was able to do considerably more work than before and after 10 weeks could take extensive walks without any difficulty in breathing. No cyanosis was detectable when at rest, and only slightly after exertion.

Case 2. A 10 year old boy was noted to be weaker than other boys. At 4 years a heart condition was diagnosed. Gradually an increasing cyanosis and

dyspnea developed. On examination, systolic and presystolic murmurs were heard. The liver was not enlarged and there was no edema of the legs. Heart catheterization, the electrocardiogram, and the roentgenogram pointed to a tricuspid stenosis.

Operation again consisted of a bilateral thoracotomy under hypothermia. The tricuspid ostium was pea-sized and a defect admitting the small finger was found in the ventricular septum. The tricuspid opening was enlarged by means of a guillotine knife, but it was considered best not to close the septum defect. There were no postoperative complications. The boy was able to exert himself with much less cyanosis than before. A soft systolic murmur was still heard.

Tricuspid stenosis is usually combined with other valvular disorders. These 2 cases leave the question of etiology open. Both patients traced their heart disease to earliest childhood. The clinical symptoms of tricuspid stenosis are often so overshadowed by the other valvular diseases that they are easily overlooked. However, in a typical tricuspid stenosis, there is a group of such typical findings that a clinical possibility diagnosis is possible.

A characteristic symptom is distention of the veins of the neck. This was present in both cases. The localization and timing of the heart murmurs distinguished it from mitral stenosis. The electrocardiogram was also suggestive. The roentgenographic findings of an enlarged right ventricle revealed a bulging of the right heart border, which is characteristic. This is most plainly seen by means of a venous angiocardiogram. An important diagnostic finding is the difference in pressure between the right auricle and right ventricle.

As to operative technique, if stretching of the opening is not sufficient, incision of the commissures is necessary. At present there are very few reports of tricuspid stenoses that have been operated upon. The operative mortality seems to be low. Bailey has operated in 9 cases of combined mitral and tricuspid stenosis without a death. There has not been sufficient time to estimate the long term results, but so far all reports are very encouraging. Both of the authors' patients have shown marked improvement in their condition. Considering the serious heart changes before operation, it is reasonable to expect a long time for restitution of normal hemodynamic conditions.

—Alfred H. Noehren, M.D.

Vascular Channels Established by Implantation of a Systemic Artery into the Myocardium. SVEN BELLMAN and HOWARD A. FRANK. *Ann. Surg.*, 1958, 147: 425.

THE LEFT INTERNAL MAMMARY ARTERY was implanted into the anterior wall of the left ventricle in 21 dogs. The artery was completely mobilized from its origin from the subclavian artery and ligated at the level of the sixth interspace. It was then implanted in the left ventricle through an artificial interventricular tunnel with its emergent end sutured to the surface of the heart. The extracardiac section of the mammary artery was wrapped and protected within an envelope of mediastinal pleura and fat. In about half of the dogs this procedure was combined with ligation of the anterior descending coronary artery. In several of the latter experiments the vascular implant traversed the area of myocardial infarction. All the animals survived the operation without infection and were subsequently sacrificed at intervals of 2.5 to 9 months. Microangiograms were made of the heart muscle by injection of the Schlesinger mass through the base of the mammary artery. This procedure was followed by special microradiographs of tissue slices 1 to 10 mm. in thickness, which were cut from the ventricle.

The extracardiac portion of the implanted mammary artery showed no signs of angulation or change in patency up to the point of intracardiac entrance where it tapered and the intima showed definite fibrous thickening while the media and adventitia were unchanged structurally. The histologic appearance was that of early arteriosclerosis with fatty deposition near the internal elastic membrane. Branching from the extracardiac section of the transplant was minimal except for a few slender communications with pericardial vessels.

The intramyocardial section of the implanted artery was patent in 13 of 14 cases but the diameter of the original lumen was retained in only 3 and the remainder showed reductions up to four-fifths of their normal caliber. This segment of the transplant was subjected to rhythmic lengthening and shortening due to myocardial contractions that caused variations in the outflow of blood through the graft. All the implants were narrowed terminally and were surrounded by a membrane of thin nonconstrictive scar tissue. In the distal third of the implant one to four branches developed and emerged from the tunnel exit to inosculate with branches of the coronary artery on the epicardial surface. The intramyocardial branches averaged 1 to 5 mm. in length and about 0.5 mm. in diameter. Microradiograms indicated that these newly formed blood vessels were derived from both the implant and the coronary artery. The accessory blood vessels formed a vascular network close to the vessel of origin and pursued a short longitudinal or circular course. Adventitial stripping or scalloping of the mammary artery did not increase significantly the number of new blood vessels. The Schlesinger mass injected into the implant passed directly to the coronary system through the newly formed connecting vessels. The communicating vessels varied in their pattern. Some descended deep into the myocardium. In others a direct communication extended into the anterior descending coronary artery, and in the remainder the vessels traversed the subepicardial level. In dogs with myocardial infarction the communications with the coronary artery formed within the zone of occlusion. Implants drawn through infarcted areas also tended to develop slender blood vessels for communication.

Ligation of the anterior descending coronary artery in control dogs was followed by the formation of intercoronary communications. These consisted of fine branches at the apex connecting with the left circumflex and the right coronary artery. Intercoronary communications were not influenced by mammary artery implantation. Within the time limits of these experiments there was no evidence of regression or further development of accessory new blood vessels.

—B. G. P. Shafiroff, M.D.

Clinical Features and Operative Treatment of Aortic Stenosis (Zur Klinik und operativen Behandlung der Aortenklappenstenose). E. Derra, K. Kaiser, and F. Loogen. *Deut. med. Wschr.*, 1958, 83: 525.

Aortic stenosis, either isolated or associated with other valvular diseases, is not an uncommon occurrence. The main cause is rheumatic endocarditis. Congenital aortic stenosis, however, is far from rare.

The congenital form involves either the valve or an elastic membranous structure obstructing the blood flow, which is located underneath the ostium.

A bicuspid valve may, although not in every instance, impede the blood flow. However, this condition is frequently associated with aortic isthmus stenosis (Reifenstein *et al.*, 42.7 per cent).

Poststenotic dilatation is a common finding in the congenital form of aortic stenosis. In the subvalvular stenosis the dilatation is restricted to the segment of outflow tract located between the stenotic area and the normal aortic valve.

In the acquired forms, secondary to rheumatic heart disease and aortic sclerosis (sclerosis annularis valvulorum), the calcification is mainly found along the obliterated commissures, the valvular ring with extension along the aortic wall, and less frequently along the valvular margins, the cusps, or the sinuses of Valsalva.

The normal circumference of the aortic valve is approximately 7.5 cm., and its surface area is approximately 3 sq. c. Significant changes in the hemodynamics, resulting in clinical signs and symptoms, are to be expected when the circumference is reduced to 2 cm. or the surface area to 0.5 sq. c.

The normal pressure gradient between the left ventricle and aorta ranges from a few millimeters of mercury in the normal, to from 20 to 40 mm. Hg in the moderate aortic stenosis to 40 to 60 mm. Hg in cases of severe stenosis.

In progressive stenosis the first symptom is usually easy fatigability followed by dyspnea on exertion and angina, the latter being the result of the discrepancy between myocardial hypertrophy and coronary perfusion, which at times may be impaired because of narrowing of the ostia of the coronary arteries. Other symptoms are dizziness and syncope, mainly following postural changes and exertion. Severe attacks of syncope may last from 15 to 30 minutes, assuming the character of a petit mal attack which at times is complicated by hemiparesis.

The clinical triad of a loud, prolonged, usually rasping systolic murmur, a palpable thrill, and a slow, weak pulse are characteristic findings. Decreased or absent second aortic tone is only found in the severe forms, which indicates marked rigidity of the aortic valve. Changes in the systemic pressure such as a low systolic pressure with a rise in diastolic pressure seem to be less uniformly observed as formerly believed. In 47 per cent of instances of isolated aortic stenosis systolic pressures of 150 mm. Hg, or higher, were observed. The x-ray findings of hypertrophy of the outflow tract with marked excursions on kymography and the frequent demonstration of a sclerotic valve are mentioned. The changes in the electrocardiogram in regard to the degree of left hypertrophy, intraventricular conduction disturbances, and myocardial ischemia enable one to estimate the severity of the lesion.

The life expectancy depends upon the severity of the lesion. The average survival time following the development of dyspnea is 23 months, of peripheral edema 9.3 months, of syncope 9 months, of congestive bronchitis 6 months, and of pulmonary edema 4 months. Once cardiac decompensation sets in recompensation is hard to realize and decompensation will recur rather readily.

According to Bailey, 44 per cent of the patients have an additional mitral stenosis, either alone or in association with mitral insufficiency of variable degrees. Other valves, mainly the tricuspid valve, may be involved also.

Since aortic stenosis poses a problem of a mechanical nature, which responds only slightly to symptomatic treatment, surgery seems to be the logical form of therapy.

The authors believe that the group of patients which are well compensated and free of symptoms (pressure gradient below 40 mm. Hg) have no need for surgery. All other patients: those with slight symptoms (gradients ranging from 40 to 80 mm. Hg.), those with angina (pressure gradient above 80 mm. Hg.), and those with beginning left heart failure should be operated upon. In spite of the poor prognosis in beginning left heart failure (in Harken's series of 34, 30 patients died within 6 months) and the difficulty in relieving the obstruction, the valve being usually so calcified that it will not open during surgery, operation is indicated.

In combined mitral and aortic stenosis the authors tried to relieve both obstructions in one operation, attacking the mitral valve first.

The authors prefer the transventricular route and use a Bailey type of dilator. The transaortic route is used only in infants and children in whom a membranous type of obstruction, usually resistant to the dilator, is expected to be present. In these cases a transaortic approach under hypothermia (Swan's method) is preferred.

The results in 24 patients are summarized as follows:

Age in years	*No. of patients*	*Results*			
		Good	*Satisfactory*	*Unsatisfactory*	*Dead*
0–10	4	3	—	1	—
11–20	8	3	1	—	4
21–30	6	5	1	—	—
over 30	6	2	2	1*	1**
	24	13	4	2	5

*Died 1 year after operation.
**Died of irreversible cardiac arrest before ventriculotomy could be performed.

Of 12 patients the preoperative and postoperative pressure gradients were recorded. It appeared that preoperative gradients ranging from 50 to 190 mm. Hg were postoperatively reduced to 30 or less.

All 5 patients who expired, died during the first 3 postoperative days.

Two patients had simultaneous isthmus and aortic valvular stenosis. In one a mitral insufficiency was present from endocarditis with extensive pulmonary vascular changes. In the other, who had an elastic

type of aortic stenosis, an open ductus was found. A third patient had extensive myocardial infarction.

The last 2 patients had left ventricular failure resistant to any known type of therapy. One, a 13 year old girl, had infundibular stenosis with an intact aortic valve, and the other, a 47 year old woman, revealed a buttonhole type of narrowing of the calcified valve. The valve was not opened during surgery; moreover, mitral sclerosis and insufficiency appeared to be present also. —*Henry Gans, M.D.*

ESOPHAGUS AND MEDIASTINUM

Results of Surgical Treatment of Hiatus Hernia in a Series of 24 Cases (Les résultats du traitement chirurgical de la hernie par l'hiatus oesophagien dans une série de 24 cas). CL. FRILEUX, C. HOUDARD, and A. MOZZANI. *Ann. chir.*, Paris, 1958, 12: 379.

THE AUTHORS report 24 cases of patients with hiatus hernia who were operated upon between 1950 and 1956. The indications for surgery were important clinical symptoms that had not responded to medical therapy: epigastric pain, anemia and hematemesis, pseudo-ulcus syndrome, and thoracic manifestations. There were 23 sliding hernias and one paraesophageal hernia. Surgery was carried out through an abdominal approach in 21 cases according to the technique of Lortat-Jacob.

There were 6 recurrences and 2 deaths; of the 6 patients with recurrences, 3 were operated upon a second time. Most of the patients were definitely cured although some complained of reflux of acid juice. —*Joseph C. Mulier, M.D.*

Physiological Considerations in the Surgical Management of Disorders of the Esophagus. W. A. BARNES and M. H. SLEISENGER. *Surg. Clin. N. America*, 1958, April, p. 331.

THE MOST IMPORTANT physiologic mechanism of the esophagus resides near the esophagogastric junction and several factors may be involved in this function. The sphincterlike action of the terminal segment and of the esophagus (vestibule) has been established by physiologic studies. The slinglike action of the right crus of the diaphragm plays a role as well as the normally acute angle at the esophagogastric junction. The mechanism at the esophagogastric junction that prevents reflux of gastric contents into the esophagus is of major importance. Disturbance of this mechanism permits reflux of gastric and/or duodenal contents with resultant esophagitis, the severity of which depends on the character of the material that refluxes.

Achalasia is discussed in some detail and it is defined as a diffuse disorder of the esophagus associated with deficiency of ganglion cells of the myenteric plexuses, particularly in the vestibular segment (esophagogastric sphincter). In this condition the sphincter fails to relax upon swallowing with a rise in pressure in the segment to very high levels and the body of the organ similarly demonstrates disturbed motility with failure of peristaltic progression to ensue with swallowing. The neuromuscular defect is parasympathetic as evidenced by the hypersensitivity of the esophageal body in cardiospasm to mecholyl. Surgical therapy is most often indicated for correction of the condition and the Heller procedure of cardiomyotomy is probably most commonly employed. In this operation if there is disruption of but a portion of the protective mechanism at the esophagogastric junction, regurgitation and esophagitis may occur.

If esophagitis persists despite medical therapy, operation is indicated to restore to as near normal as possible the anatomical situation at the esophagogastric junction. When this cannot be accomplished, re-establishment of continuity of the alimentary tract following operative intervention at the esophagogastric junction must be done with a view towards prevention of esophagitis. Attempts to prevent the occurrence or persistence of esophagitis following operative intervention at the esophagogastric junction may be divided into two groups. In the first group are those procedures that aim to reduce the volume, acidity, and peptic activity of gastric contents so that, even should regurgitation occur, little or no damage to the esophageal mucosa will result. The other group is composed of operative procedures which are designed to prevent reflux of gastric and/or duodenal contents into the esophagus. A number of these operative procedures are described accompanied by diagrams, indications, and a discussion of existing shortcomings.

Universal agreement does not exist concerning the ideal method of re-establishing continuity of the alimentary tract following surgical procedures that remove or destroy the normal relations of the esophagogastric junction. As yet there is no unanimity of opinion as to the most desirable procedure to prevent esophagitis. The authors quote Ferguson who in 1940 stated that, "The prevention and treatment of nonspecific esophagitis should be primarily aimed at keeping gastric juice out of the esophagus."

—*James H. Holman, M.D.*

Peptic Esophagitis and Peptic Ulceration of the Esophagus. BERNARD S. WOLF, RICHARD H. MARSHAK, and MAX L. SOM. *Am. J. Roentg.*, 1958, 79: 741.

ESOPHAGITIS due to chemical agents or trauma is recognized, and in addition, chronic esophagitis may be due to the complications of a direct concentric type of hiatus hernia. Associated with other local conditions or as a result of operation, a severe degree of peptic esophagitis involving a considerable portion of the distal esophagus may occur and may result in stricture formation.

Then, there are patients in whom a variable length of the distal esophagus is lined by an atypical or embryonic or heterotopic (Barrett) type of epithelium. When an ulceration occurs in this type of epithelium, it may resemble an ordinary type of peptic ulcer as seen in the stomach. The presence of a gastric-lined segment of the esophagus is not recognizable by roentgen methods in the absence of an inflammatory complication. When a discrete ulceration and/or stenosis is observed at some distance proximal to a typical hernia sac, the presence of a gastric-lined segment should be suspected.

It was further found that in the presence of a direct hiatus hernia, peptic ulceration of discrete nature may occur in and be localized to the terminal portion of the esophagus without remarkable diffuse involve-

ment of the distal esophagus and independent of gastric hyperacidity.

The article contains an excellent set of 21 figures to depict the text of the article.

—*Richard J. Bennett, M.D.*

Benign, Pedunculated, Intraluminal Tumors of the Esophagus. PHILIP E. BERNATZ, J. LAWRENCE SMITH, HENRY ELLIS, JR., and HOWARD A. ANDERSEN. *J. Thorac. Surg.*, 1958, 35: 503.

POLYPOID, INTRALUMINAL TUMORS were among the first benign esophageal neoplasms to be described. Despite their infrequent appearance, they are of considerable interest because of the sensational manner in which they may appear and because, if untreated, they may result in death of the patient.

From available gross and histologic evidence, it seems most reasonable to include these lesions as true neoplasms rather than unusual inflammatory reactions. Pathologically, these tumors comprise a somewhat heterogenous group. Grossly, the lesions are all elongated to some degree, presumably because of the molding effect of the esophageal wall. The surface of the tumor may be irregular and lobulated, and occasionally it is distinctly a multilobed structure arising from a common pedicle. Multiple tumors have been found. The mucous membrane of squamous epithelium is usually intact over the surface of the tumor but ulceration of the surface may occur. Microscopically these tumors present a mixture of loose, fibrous tissue associated with myxomatous and fatty changes. It would seem most descriptive and convenient to designate the group histologically as fibrolipomas.

The most common clinical manifestations of these intraluminal, polypoid growths result from obstruction of the lumen of the esophagus. Dysphagia, regurgitation, and vomiting may be intermittent, but the reduction in intake of food is such that significant loss of weight usually occurs. Most patients complain of substernal distress of some type. Respiratory symptoms may arise as a result of aspiration of esophageal contents or compression of the tracheobronchial tree. Ulceration of the surface of the tumor may manifest itself in melena or hematemesis. The most dramatic evidence of the lesion is its appearance in the patient's mouth with coughing or regurgitation.

A roentgenogram of the thorax may reveal widening of the mediastinal shadow. Ingested barium may divide at the level of the mass and delineate its borders precisely. Along with this evidence the roentgenologist may then note movement of the tumor and irregularities of the peristaltic wave above the tumor at the level of attachment of the pedicle. Occasionally the esophagus may be greatly dilated and the intraluminal tumor can be mistaken for a large foreign body. Esophagoscopy may be the most precise means of diagnosis. The endoscopist may first discover the tumor at its distal end. The remainder of the tumor, its pedicle and attachment may then be visualized by appropriate maneuvers.

The indicated treatment is surgical removal by oral, cervical, or thoracic approaches. Without a diagnosis and removal many persons having these benign intraluminal tumors have died from complications owing to the lesion. With surgical removal of the growth complete relief of symptoms has resulted in a majority of patients, but some have continued to have symptoms related to esophageal dysfunction.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Results of Nylon Darn Repairs of Hernia. G. E. MOLONEY. *Lancet*, Lond., 1958, 1: 273.

THE AUTHOR'S reported personal series of 253 inguinal hernias repaired with a nylon darn and surveyed more than 5 years after the last operation (with a 76 per cent follow-up) revealed 2 recurrences (0.8 per cent).

A series of 2,181 abdominal hernias repaired with nylon sutures by other general surgeons have been reviewed from the aspects of immediate and delayed sepsis, sinuses, hematomas, and "returns" with recurrence. Both monofilamentous and braided nylon were used, each in about 1,000 instances, with no apparent difference in the soundness of the resulting repairs. Both varieties of nylon reacted well to immediate sepsis and needed removal for that reason in only 1 in 1,000 repairs, for each variety. Both varieties showed about the same number of sinuses after sepsis and hematomas (21 braided, 19 monofilamentous), but the subsequent healing differed considerably. With braided nylon the 21 sinuses required removal of the nylon in 17 instances, whereas with the monofilamentous nylon 19 sinuses required removal of sutures in only 4 instances.

The cause of many of the sinuses and of the need for removal of the nylon was a delayed reaction seen almost entirely with the braided variety which came on 1 to 18 months after the insertion of the sutures; it might be more of a foreign-body reaction than sepsis.

A darn of monofilamentous nylon is easy to insert at operation, reacts well to primary sepsis, has a negligible delayed reaction, provides a sounder and more permanent repair than most, being bettered by none, and is recommended as a good method for all varieties of hernia whether they are strangulated, non-strangulated, or recurrent.

—*Robert Turell, M.D.*

GASTROINTESTINAL TRACT

Bleeding from the Upper Part of the Gastrointestinal Tract Secondary to Ingestion of Acetylsalicylic Acid; Aspirin. TIMOTHY A. LAMPHIER and W. ARTHUR YOUNG. *J. Internat. Coll. Surgeons*, 1958, 29: 395.

A SERIES of 12 cases of aspirin sensitivity is presented. In 6 of these cases the condition was apparently the result of prolonged aspirin therapy. The other 6 were true examples of hypersensitivity. Emphasis is placed on the close relationship of sweet clover disease in animals to gastric bleeding in man, secondary to aspirin sensitivity. It is pointed out that in the differential diagnosis of bleeding from the upper part of the gastrointestinal tract, hypersensitivity to aspirin should be considered. Emergency subtotal gastrectomy can and should be avoided when aspirin is known to be the causative factor.

There are two types of reaction in patients with sensitivity to aspirin: (a) alterations in the prothrombin level and (b) depletion of ascorbic acid stores, with subsequent increased capillary fragility and lack of adhesiveness of platelets.

—*John J. Maloney, M.D.*

Ischemic Necrosis of the Gastric Remnant: An Uncommon Complication of Radical Subtotal Gastrectomy. STANLEY C. FELL, BERNARD SEIDENBERG, and ELLIOTT S. HURWITT. *Surgery*, 1958, 43: 490.

ISCHEMIC NECROSIS of the gastric remnant following extensive gastric resection for the treatment of carcinoma has previously been recorded in 10 patients. The gravity of this complication is evident in that only 2 of the patients survived, one of whom required excision of the remaining gastric remnant. The authors present 2 additional cases of ischemic necrosis of the gastric pouch.

In one of these patients an area of necrosis occurred at the anastomosis of the greater curvature of the gastric remnant to the afferent loop of gastrojejunostomy. At re-exploration the necrotic area was excised and a Roux Y gastrojejunostomy was performed. The second patient did not survive and hemorrhagic infarction of the entire gastric remnant with perforation of the greater curvature above the suture line was found at autopsy.

The authors make certain recommendations regarding the technique of radical subtotal gastrectomy and the prevention and diagnosis of necrosis of the gastric remnant. The esophageal branch of the left gastric artery requires division only in cases of juxtaesophageal lesser curvature ulcers. In this situation it is necessary to preserve the upper vasa brevia which supply the vulnerable greater curvature. If splenectomy is to be performed in continuity with gastric resection, the left gastric artery should be ligated distal to its esophageal branch. Inversion of the lesser curvature portion of the gastric remnant would appear to be undesirable since it reduces the blood supply to the greater curvature where gangrene is most likely to occur.

The color of the gastric remnant and the degree of bleeding from its distal incised margin are best observed if the anastomosis is performed without the use of clamps. The application of a crushing clamp may cause submucosal vascular thrombosis or extension of thrombosis originating in an ulcer bed, thus initiating gangrene in a gastric pouch with a precarious blood supply. If inadequate vascularization of the gastric remnant is suggested by pallor, cyanosis, or sluggish bleeding, total gastrectomy is indicated.

If dye is instilled in the stomach postoperatively and appears at the drain site, immediate exploration is mandatory. It is sometimes possible to treat a small area of gastric necrosis by plication. More extensive infarction of the gastric remnant requires total gastrectomy, unless the original operative procedure allows for resection of the necrotic greater curvature

and the performance of a Roux Y gastrojejunostomy as performed in one of the cases reported by the authors. —*Orville F. Grimes, M.D.*

Transpleural Resection of Cardioesophageal Carcinoma (Text in Russian). B. A. KOROLEV. *Khirurgia*, 1958, p. 61.

THE ABDOMINAL APPROACH for resection of a cardioesophageal carcinoma does not allow a radical operation when a malignant condition involves the lower part of the esophagus and diaphragm. The author admits that by the transpleural approach it is difficult to perform total gastrectomy, but it has not yet been proved that this latter operation improves the remote results. On the contrary total gastrectomy changes the digestive function of the gastrointestinal tract and often disturbs the hematopoiesis.

The author reports 132 of his own cases of transpleural resection of cardioesophageal carcinoma with a 14.3 per cent death rate. The relatively high mortality can be explained by the advanced stage of the disease and the fact that cardioesophageal resection was often combined with resections of other organs, such as the spleen, pancreas, liver, and transverse colon.

The extent of the operation depended not only on the spread but also on the type of malignancy. In cases of necessary gastrectomy the author performed this operation above the pylorus (subtotal resection) helping to close the stomach stump by removing the gastric mucosa.

In cardioesophageal cancer the peripheral part of the stomach is seldom invaded. Therefore the resection is carried out on the proximal part of the stomach only; in this way the physiologic function of this organ is preserved.

The transpleural approach has other advantages, i.e., it allows the removal of at least 4 to 5 cm. of esophagus above the cardia, and the surrounding lymphatic glands. It also allows resection of the diaphragm when it is involved and even the performance of a splenectomy if necessary.

Metastases in the great omentum are found only in well advanced cases when dissemination has occurred.

The author describes preoperative and postoperative procedures and the operative technique in detail.

Progress in the fields of thoracic surgery and anesthesia has extended the possibility of radical operation in the case of cardioesophageal carcinoma and therefore early diagnosis becomes mandatory.

—*M. Srokowski, M.D.*

Analysis of the Results of 412 Gastrectomies (Rapport, critique des résultats de 412 gastrectomies). J. PATEL, C. NARDI, and J. LATASTE. *Arch. mal. app. digest.*, Par., 1958, 47: 101.

THE AUTHORS evaluate the therapeutic and functional results of 283 gastrectomies performed for ulcer, 104 for cancer, and 25 for various other conditions. The minimal follow-up period was one year and the maximum 7 years.

The results were classified as excellent, good, average, and bad taking into consideration pain, vomiting, hemorrhage, postprandial distress, bowel movements, weight, working capacity, alimentation, sexual activity, and the impression of the individual patient.

Of the 283 patients who had gastrectomy for peptic ulcer, 264 had gastroduodenal ulcerations. There were 6 subcardial ulcers, 51 gastric ulcers (34.4 per cent), 30 pyloric ulcers (11.3 per cent), 117 duodenal ulcers (44.4 per cent), and 20 double or multiple ulcers. There were 19 defective gastrojejunal anastomoses (12 stomal ulcers and 7 cases of anastomotic dysfunction). Two hundred sixty-six patients had two-thirds gastrectomies, 3 had total gastrectomies, and 14 exclusion gastrectomies.

The 3 total gastrectomies were performed for subcardial ulcer in 2 patients and in one for peptic ulcer at an esophagogastrostomy. The result was good in one patient, one died postoperatively, and one died independently of the operation. Of the 14 patients with exclusion gastrectomies 3 were lost to follow-up, 4 had excellent and 3 good results; 3 patients died postoperatively and one death at a later date was directly related to the operative procedure.

The operative mortality in the 266 two-thirds gastrectomies was 4.5 per cent. An additional 16 deaths were not related to the operative procedure. The 173 patients who could be followed up showed excellent results in 51 cases, good results in 50 cases, average results in 25, and poor results in 7. Thus, 81.4 per cent of the reviewed patients had excellent or good results and 14 per cent had poor results. In those with gastric ulcer excellent or good results were obtained in 88.1 per cent and poor in 4 per cent of the cases traced. Similarly, the percentages of satisfactory results in pyloric, duodenal, and multiple ulcers were 68.4 per cent, 84.5 per cent, and 91.4 per cent, respectively. The results following pyloric ulcer are poorer than the rest, but multiple ulcerations do not influence the final outcome.

The best over-all results were obtained in patients operated on in the fifth decade, the decade of the highest incidence of ulcer in the male. In the series presented 86.8 per cent of the patients were male. In cases of otherwise uncomplicated ulcer, the best results were obtained in patients with an ulcer history of 5 to 10 years' duration. Medical treatment in general should be utilized for patients with a history of less than 5 and more than 10 years' duration.

No emergency gastrectomies were performed for perforated ulcers. Two-thirds of the patients had suture of the perforation as a first procedure and one-third of the patients, after a period of aspiration, had a gastrectomy 10 to 90 days later. In ulcers associated with hemorrhage, the mortality after gastrectomy is high, but long term follow-up shows 90 per cent of the patients to have satisfactory results.

The Polya, Finsterer, and Pean techniques of gastrectomy were used with the Polya technique giving the best over-all results (81 per cent satisfactory with only 5 poor results). The Finsterer type of gastrectomy was inferior, but the Pean type of gastrectomy gave the best absolute results (84 per cent satisfactory results with no poor results). The authors believe that after the first year no worsening in the condition of a patient who has had a gastrectomy should be expected. Exclusion gastrectomy should be used with reserve for subcardial ulcers. Of 8 patients who had this operation

one died of a perforated gastrojejunocolic fistula and 7 had satisfactory results.

In gastrectomies for anastomotic peptic ulceration or dysfunction, the result was excellent in 6 cases, good in 2 cases, average in 5 cases, and poor in 2 cases. Patients who showed localized disease, such as ulcer or mechanical derangements of the anastomosis, had better results than patients with diffuse inflammatory changes at the anastomosis.

Of the 180 patients who had a two-thirds gastrectomy, 6 had enough postprandial distress to cause embarrassment and weight loss of 16 to 32 pounds. In 16 patients difficulty was less remarkable and was controlled by a medical regimen, 53 patients had minor symptoms, and 105 (58 per cent) had no difficulty. Eighty-six patients never regained their preoperative weight, 54 regained their previous weight, and 40 gained weight above the preoperative level.

Sixteen postoperative deaths were registered, one after total gastrectomy, 3 after the exclusion type gastrectomy, and 12 after other types of gastrectomy. Eight patients had hematemesis and these included 5 who had emergency gastrectomies; in 2 the operative procedure was performed under semiurgent circumstances. Three patients died of postoperative shock, 3 of hemorrhage, 2 of peritonitis, 1 of myocardial infarction, 1 of diabetic coma, 3 of pulmonary emboli, 1 of evisceration, and 1 of bile peritonitis originating in the liver. The mortality in patients with bleeding was 11.7 per cent, but only 3.7 per cent in the other ulcer patients. A perforation of an ulcer sutured in the past or treated by aspiration does not increase the risk of a subsequent gastrectomy; the mortality in these cases equaled that in the rest of the gastrectomies (3.7 per cent). Reoperation on a patient with a recent gastrectomy is marred by a high mortality (7 out of 16 patients died). The decision to reoperate on patients with postoperative abdominal complications is always difficult and the authors' tendency is to reoperate earlier.

One hundred four patients were operated on for gastric cancer. Two patients had cancers of the cardia and 10.5 per cent had lesions high in the stomach; 25 per cent of the lesions were in the middle third, 47.3 per cent in the antrum, and 15.3 per cent in the pylorus. There were 22 total and 82 subtotal gastrectomies performed.

The mortality in 22 total gastrectomies for cancer of the cardia (2), high situated cancers (10), mid-third cancers (8), and antral cancers (2) was 36.3 per cent. Eight patients died of tumor recurrence (36.3 per cent) and only 1 good result was obtained (4.5 per cent); 72.2 per cent of the patients died more or less rapidly of the underlying disease.

Of the 82 patients who had subtotal gastrectomy for a high situated cancer (1), middle third cancer (18), antral cancer (47), and pyloric cancer (16), 23.1 per cent expired. In 14 the cause was cancer spread. Functionally, 2 excellent results, 10 good, 6 average, and 2 poor results were obtained. Of these patients 40.2 per cent died of cancer more or less rapidly, 2 are living with a recurrence, and 34.1 per cent are living with no evidence of recurrence.

When the total gastrectomies were compared to the subtotal gastrectomies from the survival and functional standpoint the results were worse in the first group. In high situated cancer a total gastrectomy did not permanently cure any patients; 4 postoperative deaths and 4 early recurrences show this procedure to be rather unrewarding. A 5 year cure was obtained in 1 patient with only a rim of stomach preserved at the esophagus.

The known survivals without recurrence amounted to 9 per cent of the patients with high situated cancers, 19.2 per cent of those with mid-third lesions, 44.8 per cent with antral, and 6.2 per cent with pyloric lesions. The prognosis of cancer at the two extremities of the stomach is the most grave. The poor prognosis of pyloric cancer is explained by a rapid lymphatic spread into the portal area.

In view of the better results of subtotal gastrectomy, a more radical course should be adopted only with hesitation in cases of cancer of the middle third. Total gastrectomy should be reserved for very high situated lesions and in cases of absolute necessity as neoplastic relapse in a gastric remnant. As long as the stomach can be transected 5 cm. above the lesion, a small rim of gastric mucosa should be preserved. Total gastrectomy should not be the choice in antral or pyloric lesions. For pyloric cancers it is useful to extend the operation to include the lymphatics at the hepatic pedicle.

In 15 patients with bleeding gastric cancers, the mortality for total gastrectomy was 100 per cent, but in 10 subtotal gastrectomies no mortality was noted. In bleeding cancers, therefore, total gastrectomy should be performed only exceptionally.

The fate of the patients as to recurrences is determined in the first 3 years; this is especially true of lesions situated high in the stomach. Such cancers recur more rapidly than antral or pyloric lesions which may relapse much later. The chance of recurrence decreases with the period elapsed from the time of operation.

Twenty-five gastrectomies were performed for other lesions than cancer or ulcer. The 18 gastric lesions included 3 schwannomas, 1 tubercular lesion, 2 inflammatory tumors, 1 plasmacytoma, 1 prolapse of gastric mucosa, 1 polyp, 1 myoma, 2 cases of intestinal metaplasia, and 6 undiagnosed lesions. The pyloric lesions included 2 benign tumors and 1 case of intestinal metaplasia. The duodenal lesions included tuberculosis, a diverticulum, and inflammation. In this series 2 postoperative deaths were noted, one following a total gastrectomy for hemorrhagic schwannoma. The functional results were comparable to those after gastrectomies for ulcer. The patients with benign pyloric tumors probably would have been better off with less extensive gastrectomies. The importance of biopsy of such lesions at the time of operation is stressed. —*Karel B. Absolon, M.D.*

Acute Pseudomembranous Enterocolitis, a Postoperative Secondary Disease (Enterocolitis acuta pseudomembranacea, eine postoperative Zweiterkrankung). F. Holle, R. Schautz, and F. Becker. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 219.

The increasing incidence of acute enterocolitis as a postoperative complication has been ascribed to antibiotics.

The contradictory concepts of enterocolitis are due to the failure to distinguish two types of the condi-

tion, namely: (1) acute enterocolitis which occurs mostly but not exclusively after laparotomies and (2) pseudomembranous enterocolitis which is provoked by antibiotics and is mostly seen in patients with internal diseases.

The two types of acute enterocolitis may be distinguished. In the nontoxic type of colics, watery sanguineous stools and circulatory failure caused by dehydration develop in succession, whereas in the toxic type a paralysis of circulation appears unexpectedly and suddenly. Such complications usually develop on the second or third postoperative day. On the other hand, the onset of pseudomembranous enterocolitis usually takes place between the fourth and tenth day after the beginning of administration of antibiotics and is characterized by high fever, chills, profuse diarrhea, dehydration, hypokalemia, oliguria, urinary retention, anxiety, and shock.

Three stages of pseudomembranous enterocolitis may be differentiated: (1) the functional toxic stage, characterized by meteorism, colic, mild fever, increase in pulse frequency, and slight diarrhea; (2) pseudomembranous diarrhea accompanied by circulatory failure; and (3) septicemia and general toxicity, intestinal hemorrhages, and circulatory collapse. Various transitional forms may be observed.

At autopsy the greatest changes are found in the large intestines, whereas the ileum is only rarely affected. Hyperemia of the mucosa is combined with the formation of pseudomembranes and erosions.

The harmful effect of antibiotics is due to their antigenic activity, destruction of the normal intestinal flora, superinfection by gram-positive micro-organisms, and impairment of the synthesis of vitamin B. Changes of conditions of immunity have an untoward effect on the stress preparedness of the organism.

In the Surgical Clinic of the University of Würzburg enterocolitis occurred in 8.5 per cent of extensive abdominal operations, such as total gastric resection, resection of the colon, or abdominoperineal resection.

In 11 of 128 patients who had undergone a laparotomy, enterocolitis developed. Among 100 patients on whom a chest operation had been performed, the same condition appeared in 3, and it was found in 13 of 100 patients after neurological procedures.

The most important prophylactic measure is observation of the intestinal function. Odorless, frequent defecations are a warning signal and indicate bacteriologic studies of the feces and cessation of the administration of antibiotics. Large doses of antibiotics, especially neomycin and nebacetin, should be given for a very short period before operations on the intestines. Endogenous superinfection and exogenous cross infection can be avoided by strictest asepsis. Resistant bacteria in the patient's nose and throat should be eliminated preoperatively. Physicians and the hospital personnel should undergo frequent bacteriologic examinations. The duration of postoperative prophylactic administration of penicillin and streptomycin should not exceed 4 days.

The treatment of iatrogenic enterocolitis consists of re-establishment of electrolyte and water balance and administration of nor-adrenalin. Frequent determinations of the blood pressure, carbon dioxide combining power of the serum, sodium, potassium and chloride contents are essential. If resistant staphylococci are found, erythromycin or nebacetin is indicated. Corticotropic hormones, blood transfusions, vitamin B complex, menadione, high caloric protein diet, yoghurt, and oxygen inhalations complete our armamentarium.

—*Joseph K. Narat, M.D.*

Acute Appendicitis. J. A. CAMPBELL and D. C. MCPHAIL. *Brit. M. J.*, 1958, 1: 852.

A REVIEW is given of a series of 549 patients with appendicitis; 64 per cent were less than 30 years of age and 5 per cent were more than 60.

No patient was treated conservatively. In 80 per cent the operation was carried out before the infection had spread beyond the appendix, but in the remaining 20 per cent drainage of the area was necessary. It was found that the incidence of complicated appendicitis increased in the elderly patient, and that this was not solely due to delay in diagnosis but also the more fulminating process in the elderly.

The classical textbook description of appendicitis was not often met with, and the frequency of atypical presentation is stressed. Emphasis is made on the importance of suspecting appendicitis in all patients who present abdominal pain irrespective of age.

The characteristic breath fetor and furred tongue are important signs, and if associated with much vomiting or diarrhea suggest that the infection has already spread beyond the appendix.

Local tenderness over the inflamed appendix, usually in the right quadrant of the abdomen, is the most important sign; it may even be the only sign, but, on the other hand, it may be absent in the very obese or elderly patient.

No reliance should be placed on the pulse rate or temperature for the early diagnosis of appendicitis. If there is a rise of temperature in the elderly patient, the infection has almost certainly spread beyond the appendix.

If operation is carried out while the infection is confined to the appendix the mortality is at the irreducible minimum for any surgical procedure. In cases in which appendicitis has progressed to abscess formation, the authors believe it is safer to operate and to drain the abscess. If the appendix presents, it is removed, but if appendectomy is difficult and would require some dissection the abscess is drained.

It is emphasized that early diagnosis and prompt surgical treatment are still the most important principles in dealing with acute appendicitis, the most common surgical emergency.—*Benjamin Goldman, M.D.*

Diverticulitis of the Right Colon. GEORGE A. DEGENSHEIN. *Arch. Surg.*, 1958, 76: 564.

DIVERTICULITIS of the ascending colon is a pathologic entity distinct from that which occurs in the descending colon. Diverticula on the right side are usually solitary. They are true diverticula and contain all coats of the bowel wall, in contradistinction to the lesions on the left side in which there is herniation of the mucosa through the muscular coat. The lesions on the right side are probably congenital in origin, whereas those on the left are acquired.

Of the many etiologic theories of diverticula of the ascending colon, which include: (1) eversion of the cecal wall between two constricting anatomic bands, (2) traction by adhesions, (3) eversion of a weak spot caused by migration of a purse-string suture, (4) appendiceal-stump abscess, (5) inherent cecal-wall weakness, and (6) increased intracolic pressure, none seem to be reasonable. Perhaps the most plausible theory is that these diverticula are related to the transient multiple appendices seen in the embryo.

Diverticulitis of the ascending colon is uncommon. The preoperative diagnosis is almost invariably one of acute appendicitis or perforated neoplasm of the cecum. A palpable mass in the right lower quadrant has been found with sufficient frequency to make it a diagnostic aid.

The author presents a series of 7 cases of diverticulitis of the ascending colon. The factors of treatment are discussed; these include inversion of the diverticulum by purse-string suture, local resection of the diverticulum, placing a drain in the abscess cavity if present, or simply closing the abdomen without drainage. The more radical measures include exteriorization and right hemicolectomy. In no case in this present series was it feasible to invert the inflamed diverticulum. Theoretically this procedure would be desirable but it should be used only when the inflammatory process is localized sufficiently to allow suture of uninvolved tissue. Local resection was performed twice in the present series. In 4 instances in the author's series an exteriorization procedure was accomplished. The use of this technique was made necessary because the differentiation between inflammation and malignancy was impossible, and secondly, the operative procedures were performed as emergencies in which the bowel had not been previously prepared.

The diagnosis is usually evident at operation. However, when acute appendicitis is suspected and a normal appendix is found the ascending colon should be examined for acute diverticulitis.

The author believes that when circumstances permit, a conservative operative procedure should be performed. Ill-advised conservatism, however, may become the most hazardous method. With the use of fluid replacement, antibiotics, and good anesthesia, hemicolectomy is the most desirable procedure for the most severe case. In a good-risk patient it is a satisfactory definitive procedure which reduces the length of hospital stay and eliminates the problems associated with an ileostomy. In poor-risk patients in whom peritoneal soiling is extensive, exteriorization may be the procedure of choice.

The author believes that as experience accumulates, primary hemicolectomy will be done more frequently in the future than it has in the past.

—Orville F. Grimes, M.D.

Ulcerative Colitis. ALBERT E. COATES. *Brit. J. Surg.*, 1958, 45: 519.

PRIMARY COLECTOMY is the operation of choice when surgery is required for ulcerative colitis. Occasionally, preliminary ileostomy is done in the severely debilitated individual without heavy bleeding. There were 5 deaths following surgery in 36 patients.

The paper is devoted mainly to a discussion of the 12 cases in which ileorectal anastomosis was done. "The criteria for preserving the rectum and hoping for a later anastomosis are: ulceration must be less marked in the rectum, some elasticity be present, the valves should be intact—in other words the rectum should be a container and the patient should be in the younger age group." In most of the reported cases ileostomy preceded colectomy. At the time of colectomy the divided rectum was closed or the ileostomy and distal sigmoid colon were laid side-to-side in double-barrel fashion. In those with the closed rectal pouch, continuity was later established by anastomosing the ileum to the side of the rectum. There were less complications with this method than with end-to-end ileorectal anastomosis. When a double-barreled ileostomy-sigmoidostomy had been made, restoration of continuity was accomplished by crushing the spur. Among the 12 patients treated by restoration of bowel continuity there were 2 deaths, one from a postoperative subphrenic abscess and the other from unrelated causes. The remaining patients had satisfactory results.

The author emphasizes the importance of selection of the cases for ileorectal anastomosis. Several patients in whom the rectum was preserved were denied restoration of bowel continuity because of continuing local disease.

—Lockert B. Mason, M.D.

Lipomas of the Colon; With Report of 5 Cases. ROBERT P. HENDERSON, ELMER J. HARRIS, and JAMES M. PACKER. *Am. J. Roentg.*, 1958, 79: 843.

LIPOMAS represent the second most common benign tumor of the colon; about one-half of the lipomas occur in the cecum and ascending colon. The symptomatology is not specific and often it depends upon the size, location, and behavior. There may be obstruction varying from constipation to acute obstruction or, on occasions, alternating diarrhea and constipation. Ulceration, necrosis, and secondary inflammation are not uncommon.

It has been pointed out that diagnosis of a lipoma of the colon cannot be made before surgery except in an occasional case in which the lipomas have been passed spontaneously, or on observing the tumor which has intussuscepted to the rectum.

The characteristic appearance of a lipoma is that of an intramural extramucosal tumor with smooth margins, slightly lobulated and with a broad base. Occasionally one may find smooth margins in a broad base but no lobulation. The lipomas tend to be softer than other tumors when compression is used. The possibility of a lipoma should be considered in any case of intussusception of the colon in an adult. Five cases of lipoma of the colon are presented by the authors.

Surgery is the only treatment and excision is indicated on all patients with a tumor of the colon regardless of the roentgenographic impression as to the nature of the tumor. Lipomas do not become malignant, but they are symptomatic in over 80 per cent of the cases. Oftentimes a limited resection or a simple excision is indicated if the surgeon considers the lesion as being possibly a benign one.

—John E. Karabin, M.D.

Pathology and Surgical Treatment of "Imperforate Anus". ALEXANDER H. BILL, JR. *J. Am. M. Ass.*, 1958, 166: 1429.

THE AUTHOR presents the concept that imperforate anus should be considered as an ectopic rectal opening. He suggests that in the absence of a normally placed anus, as a rule, an opening will be found from the tip of the rectum in some other position. This opening can be expected to be into the urethra or bladder in the male or into the vagina in the female. Such an opening may be minute in the male infant. It may be so small that meconium will not pass through initially and therefore will not appear in the urine. Nevertheless, if such a communication remains unrecognized and is not closed surgically, fecal contamination of the urinary tract can be expected as the infant grows.

The embryology of the condition is reviewed and several aspects of the development of the urogenital and rectal areas in the perineum are discussed. The rectal opening in either sex may be anteriorly placed in the perineum. The embryologic explanation seems to be that there is normally a migration of the rectal opening from the original embryologic cloacal stage downward to the perineum and then posteriorly to the normal anal position. The migration may be arrested at any point to provide a variety of anatomic arrangements, each with possible communications to the urinary tract or vagina.

Surgical repair is aimed at displacing the ectopic rectal opening downward and posteriorly to lie within the already formed external anal sphincter. The procedure can be performed through the perineum in the female but usually requires a combined abdominoperineal approach in the male.

—Orville F. Grimes, M.D.

Hemorrhoids (Ueber die Haemorrhoiden). F. STELZNER. *Deut. med. Wschr.*, 1958, 83: 569.

THE CONCEPT that hemorrhoids present dilated anal veins is erroneous. A patient whose conditon is designated as external hemorrhoids, as a rule, suffers from either a perianal hematoma originating from a normal perianal vein or hyperplastic perianal skin folds. Free bleeding is never associated with these conditions. An attempt at reposition is doomed to failure in these patients and is associated with marked pain since the subcutaneous hematomas are localized at the anal margin outside of the anal canal. Conservative therapy with sitz baths will accomplish a cure and complete resorption of the hematoma. Only occasionally do such hematomas progress into fibrotic forms or abscesses which necessitate excision or incision.

Perianal skin folds may be excised if they cause eczema or pruritis ani. Any lesions at the anterior or posterior commissure should be treated only with reluctance as painful fissures often result. Perianal skin folds may also result from chronic cryptitis. An occasional finding of slightly dilated veins at the external anus is rarely of therapeutic significance; if symptomatic, three radial skin incisions with ligation of the veins will effect cure unless internal hemorrhoids are in communication with such veins.

Miles showed in 1919 that internal hemorrhoids develop in an area in which the three superior hemorrhoidal artery branches enter the upper reaches of the anal canal. Internal hemorrhoids are not merely dilated veins but vascular hyperplasias stemming from the arteries.

In the initial stage, developing hemorrhoids might cause small amounts of bright red bleeding which suggests an arterial origin. These arterial branches are in continuity with venous structures which penetrate the sphincter and continue into the portal system.

At present the best therapy for hemorrhoids of the first degree is injection with a 5 per cent phenol-almond oil solution. Injections are made into the submucosa above the hemorrhoids. Although such therapy is successful in 98 per cent of cases, injection therapy will be more successful in the male than the female. Females more commonly demonstrate the intermediate type of hemorrhoidal veins reaching through the anal canal. Hemorrhoidectomy should only rarely be performed before the age of 30 as hemorrhoids at that time are not fully developed and recurrences are common.

Hemorrhoids of the second degree will prolapse on defecation but reduction will occur spontaneously. Fibrosis, loss of elasticity, fissures, and venous congestion are common. Injection therapy may be used in the very young and very old individuals, otherwise surgical therapy is indicated.

The operative procedure advocated is one originally devised by Salmon. In addition to anesthesia a .5 per cent solution of novocaine is injected at 3, 7, and 11 o'clock to decrease bleeding. The hemorrhoid is pulled externally until the rectal mucosa is visualized. After incising the cutaneous aspect dissection is continued, visualizing the internal and external sphincters. The internal sphincter is fibrosed in all chronic processes at the lower margin and a small incision will transect this constricting pecten-band ring. This useful maneuver is of no risk to postoperative continence. The hemorrhoidal stem is transfixed with chromic catgut exercising care to leave cutaneous bridges between the individual excision areas; grasping too much mucosa in the transfixing suture must be avoided.

Third degree hemorrhoids present prolapsed congested blue-red structures irritating the outside anal skin and thus causing pain. An operation identical to that used in hemorrhoids of the second degree consists of ligature of the three main hemorrhoidal knots, but more skin must be excised. An occasionally occurring edematous swelling of one of the skin folds is of no consequence.

Postoperatively, opiates are never used; on the second and third day cathartics are given along with a fifty ml. olive oil enema combined with fifty ml. of gruel. Postoperative wound infection will not occur as long as primary suture is avoided. Sitz baths and dilatation of the anus are recommended.

Whitehead's radical operation is considered unphysiological, unnecessary, and prone to complications.

Postoperative bleeding occurs in some 0.5 per cent of cases usually around the eighth day, the time the ligature falls off. A sponge-encircled rubber tube must then be introduced under anesthesia; this will establish hemostasis after the sphincter clamps down on it.

In cases of thrombosed hemorrhoids the author reduces the hemorrhoid under general anesthesia and

puts the patient on bed rest with cathartics and oil enemas daily. Immediate operation should never be performed, he states. Although after 15 days the acute inflammatory process will have subsided, an operative procedure should be put off for 3 months.

—*Karel B. Absolon, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Polypoid Mucosal Lesions of Gallbladder. G. M. CARRERA and SEYMOUR FISKE OCHSNER. *J. Am. M. Ass.*, 1958, 166: 888.

THE AUTHORS state that polypoid lesions of the mucosa of the gallbladder are more common than has been realized in the past. They found 28 cases in 1,331 consecutive cholecystectomies in the 15 year period ending April, 1957. These included inflammatory polyp, cholesterol polyp, papillary and nonpapillary adenomas, polypoid adenomyoma, and carcinoma in situ. These growths are small and soft; they are easily torn from their pedicles and especially difficult to recognize if gallstones are associated with them. It is sometimes, but not always, possible to distinguish them from radiolucent gallstones in roentgenograms of good quality. Since there is reason to suppose them potentially malignant, the authors believe it wise to consider cholecystectomy unless there are definite contraindications. —*Robert Turell, M.D.*

Reconstruction of Injured and Stenosed Bile Ducts (Die Operationen zur Wiederherstellung der Gallenwege bei Stenosen und Verletzungen). HANS-FRIEDRICH OESTERN. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288:69.

THE ETIOLOGY of stenosed bile ducts is at times far from clear. Chronic fibrosing cholangitis has, according to the author, been observed and described as a distinct entity in the course of chronic pancreatitis, resulting from congenital anomalies or impacted stones. In 2 of the author's cases in which nearly complete obliteration was present the inflammatory changes appeared to be secondary to impacted stones.

The majority of strictures, however, result from cholecystectomy or other upper abdominal surgical procedures. The modes of injury are discussed along with emphasis on meticulous dissection prior to any clamping or ligating. The blind application of clamps to control hemorrhage and the tenting of the common duct at the site of its junction with the cystic duct are the main causes of injury. The author emphasizes the necessity for gentleness in the use of dilators and stone-clamps, and for avoiding the use of T tubes of too large size since they cause pressure damage to the epithelium.

Injuries of this nature are seldom detected during the original operation (Lahey, 4 to 5 per cent of cases); in the author's series of 20 cases (17 times following cholecystectomy, 3 times following gastric resection) the injury was detected in only 3 cases.

Treatment depends upon the type, the extent, and the location of the stenosis or injury. After dissection the stenosed part of the duct is resected. Care is taken that all scar tissue is resected because

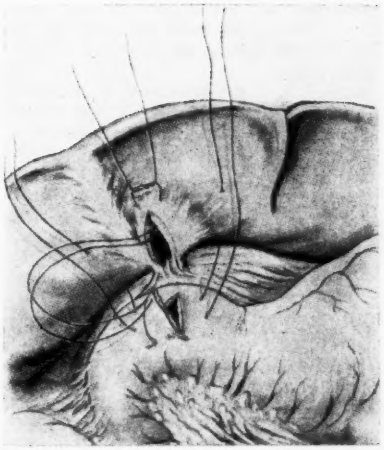


FIG. 1 (Oestern). Plastic operation according to Goetze.

reanastomosis of scarred tissues will result in the formation of a stricture. Therefore, frozen sections of the free edges of the duct are sometimes necessary. Twenty-five reconstructive procedures were done.

Mobilization of the distal part of the common duct is accomplished by the method described by Lahey (*Surg. Gyn. Obst.*, 1950, 1: 25). There should not be undue tension on the suture line and the mucosa should be approximated meticulously.

Splinting of the anastomosis is accomplished in a number of ways: over a T tube (which should never be brought out at the site of anastomosis), over a transduodenal tube, brought to the outside through a duodenostomy (Voelcker, 1911). One of the holes should be in the part of the tube lying in the duodenum. It is advisable to irrigate these tubes regularly, during the 3 to 12 month period they are left in place, to prevent incrustation.

Of 3 of the author's patients in whom the duct was reanastomosed and the anastomosis splinted for some time, one was free of symptoms 5 years postoperatively and 2 were subicteric (bilirubin 1.9 and 2.9) without other symptoms such as colic or fever.

The author condemns the use of a free prosthesis for two reasons: either it becomes incrusted, necessitating a second operation for its removal, or it does not remain in place, disappearing into the bowel at any time after surgery. In 4 cases in which a free prosthesis was used, one patient was free of symptoms 10 years following the operation, 3 were failures.

Implantation of a fistulous tract into the bowel is not recommended because of the stenosis which invariably seems to occlude the tract.

Direct implantation of the proximal stump into the duodenum or into a Roux Y loop was successful in 2 instances of stenosis following gastric resection. Since the gallbladder is usually removed this organ cannot be used to reinstitute continuity of bile flow.

Finally the procedure described by Goetze (1930) was applied in 13 cases. Several patients had under-

gone previous reconstructive procedures. Eleven are free of symptoms and show normal liver function tests. Five of these operations date back 2 to 11 years. Two patients died.

The principle of the operation is to establish as wide an anastomosis as possible between the common hepatic or proximal common bile duct on one side and the duodenum or an isolated jejunal loop on the other side (Fig. 1). The duct is split open widely through its scar tissue in a longitudinal direction. A triangular flap is formed from the anterior duodenal wall or isolated jejunal loop keeping the stoma in the bowel open when it is sutured against the opened duct. —*Henry Gans, M.D.*

True Stenosis of the Splenic Vein; Its Morphology, Clinical Picture, and Hemodynamics (Ueber die echte Milzvenenstenose; Ihre Morphologie, Klinik und Haemodynamik). A. Gütgemann, G. Hennrich, and H. W. Schreiber. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 117.

Among the splenomegalies there is a group which is due to a recurring interference with the emptying of the splenic vein. The clinical changes found in cases of stenosis of the splenic vein are: a tumor of the spleen, occasionally changing in size, hypersplenism, and frequent bleeding in the region of the digestive tract, such as occult blood in the stool or hematemesis. Characteristic of true stenosis of the splenic veins is the absence of diseased functional or morphologic changes in the liver.

When the etiology of true stenosis of the splenic vein is studied, a discrepancy is frequently found between the clinical symptom complex and the absence of an organic substratum. It is surprising how seldom mechanical, infectious, or toxic factors resulting in a thrombosis can be demonstrated. This uncertainty in the etiology of almost identical clinical conditions is reflected in the many synonyms, such as thrombophlebitic splenomegaly, Banti's disease, venous obstruction of spleen, splenic vein sclerosis, and splenic vein thrombosis. The close connection with the portal vein system is reflected in such terms as the splenic form of portal vein thrombosis, portal plethora, and others. Thus the cause of stenosis of the splenic vein was sought in the circulatory structure within the spleen itself. The etiology of these cases remained doubtful.

Three cases are cited to bring up the possibility of extrasplenic vessels or intraorganic changes as possible causes of the stenoses in these cases. The clinical findings were also in line with this theory.

The leading symptoms were repeated bleeding from the stomach or esophageal varices and tarry stools. After hematemesis, the enlargement of the spleen, which was always of a hard consistency, was measured. Feelings of pressure in the upper abdomen which might have provided a clue to the diagnosis, were disregarded. A change in the size of the spleen in an 8 year old child was palpable. This dependence of the size of the tumor on the bleeding of the varices in a child is pathognomonic of splenic vein stenosis.

Although a greatly hypertrophied spleen and a clinical picture of splenic vein stenosis may be attributed to a liver cirrhosis, the diagnosis of the former could be verified at operation macroscopically, by palpation, or by splenoportogram. In all cases there was a lengthening and coiling of the splenic vein. Histologically a typical phlebosclerosis of the vein was found.

The frequency of anomalies would point to a constitutional cause. This possibility is discussed, but no definite connection could be found. The clinical symptomatology of organic splenic vein stenosis seems to spring from interference in the hemodynamics of the portal system. The spleen as a whole has the ability to press the blood through the splenic vein and thus affect the portal circulation. Thus we see the hemodynamic effects on the splenic vein. This affects all the tissues of the spleen and causes a vicious circle. These various changes are described in detail. All changes definitely are caused by splenic vein stenosis and this term is therefore recommended as the name for the disease.

The question of reversibility of this condition is discussed and it is reported that long standing tumors of the spleen may decrease after portacaval anastomosis.

Whereas many splenomegalies are attributed to constitutional factors or changes in innervation of the spleen, or are diagnosed as infectious-toxic splenic tumors because pathologicoanatomic and histologic examinations are not made, they may still be due to changes in the portal vein, although secondary changes may play a part. A case is cited to demonstrate this fact. It also demonstrates the importance of taking the portal vein pressure and a portogram as well as considering all factors that have a dynamic effect on the spleen and its circulation. In this, the splenic vein plays an important part and deserves careful consideration.

The operative procedure in true splenic vein stenosis depends upon the location of the obstruction. If the stenosis is peripheral, i.e., toward the spleen, then splenectomy without anastomosis is sufficient. If the gastric veins are distended, one must assume an extension of the vein sclerosis and a splenectomy plus a splenorenal anastomosis is indicated. If a more serious anomaly can be absolutely excluded, phlebosclerosis assumed to be the only cause, and a compensatory hypertrophy assured, the spleen need not be removed and a possible portacaval anastomosis is indicated. In all methods, any liver changes that may be etiologically very important, should be excluded by a biopsy and a frozen section. —*Alfred H. Noehren, M.D.*

GYNECOLOGY

UTERUS

Uterine Infarction (Les infarctus uterins). E. HERVET. *Sem. hôp. Paris, Ann. chir.*, 1958, 12: 165.

THE AUTHOR considers the clinical picture and the pathology of uterine infarction resulting from mechanical efforts at criminal abortion. If not treated promptly, death is said to occur within 2 to 3 days as a result of shock, sepsis, hemorrhage, and/or impairment of renal function. Septicemia due to Clostridium welchii may mask the signs and symptoms of uterine infarction. The treatment is essentially surgical, that is, abdominal hysterectomy. —*D. N. Danforth, M.D.*

Importance of Myomectomy in the Treatment of Uterine Fibroids (Importancia de la miomectomia en el tratamiento del fibromioma uterino). ROBERTO M. GORI. *Obst. gin. lat. amer.*, 1957, 15: 407.

THE AUTHOR presents a brief historical review of myomectomy in the treatment of uterine fibroids and discusses 150 cases from his own hospital. The patients ranged in age from 19 to 53 years; 88 of them were between the ages of 31 and 40 years. Eighty-one were studied for obstetrical effects. Twenty-seven of these patients were operated on during pregnancy and 54 became pregnant after the myomectomy. Of the 27 patients operated on while pregnancy existed, 5 aborted and 1 had a still-born macerated fetus; there were 4 forceps and 3 cesarean deliveries and the rest were normal deliveries without maternal mortality. In the patients who became pregnant and delivered after myomectomy was performed, a cesarean section was only rarely considered necessary, i.e., in 3 cases. The author does not consider rupture of the uterus a real cause for concern in these patients and would not entertain a change in policy for fear of this complication in any patient in whom a satisfactory technical myomectomy and an uncomplicated postoperative course had obtained.

Further statistical details in this series of 150 cases include a moderate postoperative morbidity, one case of intestinal obstruction requiring reoperation, 6 cases of wound sepsis, and 3 deaths.

The author also discusses the pros and cons of hysterectomy versus myomectomy and concludes in favor of myomectomy for the usual reasons cited in the literature. He states also that he is in agreement with other authors cited, in the opinion that technical considerations are important in this operation. They should include a minimum number of uterine incisions, the use of the anterior surface when feasible, nonresection of normal uterine wall, and the use of a tourniquet around the uterine arteries to control excessive blood loss. —*Howard Ulfelder, M.D.*

Carcinoma of the Cervix (Carcinoma del muñon cervical). VICENTE JULIO BELLOMO. *Prensa med. Argent.*, 1957, 44: 3222.

THIS ARTICLE discusses the problem of carcinoma of the cervix following subtotal hysterectomy. The author defines two groups of cases, those in which cancer was presumed to be present at the operation, and this he considers to have been the case whenever the diagnosis was established within 3 years before the operation. The second group, of course, were the cases in which the diagnosis was first made afterward.

On the basis of his own experience and an extensive review of the literature, he concludes that 1 to 3 per cent of all cases of cancer of the cervix are in the cervical stump. He then continues with a review of many other reports, discussing them under headings of incidence, etiology, age of patient, symptoms, diagnosis, progress of disease, prognosis, pathologic anatomy, treatment, prophylaxis, and conclusions.

He adds to the literature 7 cases seen at his hospital during 23 years in a total series of 219 cases of cervical cancer. Treatment in his own cases consisted of surgery and radiation, with apparent cure in 3 of 4 cases that were followed up.

The author concludes that the present day techniques and statistics favor the performance of total hysterectomy for benign disease as prophylaxis against subsequent malignant change in the cervix.

—*Howard Ulfelder, M.D.*

The Treatment of Carcinoma of the Cervix with Full Irradiation Therapy Followed by Radical Pelvic Surgery. CHARLES S. STEVENSON. *Am. J. Obst.*, 1958, 75: 888.

THERE HAS BEEN considerable dispute in the past half century as to whether surgery or irradiation therapy is the best means of treating carcinoma of the cervix, and the question has not been settled today. The best 5 year survival statistics following irradiation therapy have not been bettered appreciably by the best results from radical surgery, although the 10 year survival rate following surgery is somewhat of an improvement over that following irradiation. This is true only for cases in the clinical stages that are early enough to be considered operable. While the 5 and 10 year salvage rates for both irradiation therapy and surgery have shown marked improvement in the past 40 years, they are still relatively similar, and neither form of therapy alone seems to offer hope for a great improvement in the next several years.

In 1946, as a result of the advances in anesthesiology and of the effectiveness of the new antibiotic agents, it seemed to the author that an experimental series of cases of cervical carcinoma treated by complete irradiation therapy followed by the radical Wertheim-Bonney operation should be initiated as a long range project. The opportunity to do so finally presented itself early in 1949, and the first patient was operated upon in March of that year.

As a result of experience with this method of therapy the author feels that the primary reason for giving full irradiation is that it will permit the performance of the surgery with much less danger of spreading viable cancer cells. He believes that the irradiation may well be considered an essential part of the preparation of

the patient for operation. He advised that it is best to wait for about 12 to 16 weeks following completion of the irradiation therapy before operating, because by this time practically all of the full-killing, attenuating, arresting, and walling-off effect of the irradiation will have been exerted upon the foci of cancer in the pelvis.

The method of irradiation therapy and the operative technique used are discussed. Surgery is performed in all stage 1 and stage 2 patients. Stage 3 patients are operated upon, but if at the time of laparotomy there is noted extension beyond the pelvis, the case is considered hopeless and no further surgery is performed.

In the series of 195 cases of carcinoma of the cervix, 143 were treated with irradiation alone and 52, or 27 per cent, were treated with full irradiation therapy followed by the radical Wertheim-Bonney operation. The operative mortality in the 52 cases was zero. There was one postoperative ureterovaginal fistula, an incidence of 2 per cent, and 4 vesicovaginal fistulas, an incidence of 8 per cent. Five of the 52 patients died, one from primary adenocarcinoma of the liver after surviving for 5 years and 5 months, one from intracranial hemorrhage and hypertensive cardiovascular disease 3 years following the operation, and 3 from recurrence of their pelvic cancer.

—E. Elliott Lazarus, M.D.

Sarcoma of the Uterus; Anatomoclinical Contribution (Sul sarcoma dell'utero; contributo anatomo-clinico). C. Zucchini. *Riv. ital. gin.*, 1958, 41: 61.

The patient was an emaciated, anemic, 52 year old married woman who had borne 9 healthy children and undergone 2 abortions. She had passed the menopause when 50 years of age and now consulted the author because of irregular attacks of bleeding for 18 months.

At examination the uterus was found to be somewhat enlarged and softer than normal. The examination produced some bleeding. The manipulations incident to curettement gave the impression that the uterine cavity was enlarged and irregular in shape. Histological examination of the tissue removed showed a polymorphous, giant cell sarcoma with extensive hemorrhagic and necrotic areas.

The usual Wertheim procedure was performed. Macroscopic examination of the removed specimen disclosed a typical malignant polyp.

A postoperative roentgenogram, taken 4 months later, disclosed two rounded, clearly delineated shadows in the right lung, with increased shadow density of the corresponding pulmonary hilus. These shadows, particularly the lower one, increased rapidly in size, and the patient died 13 months after the operation.

—John W. Brennan, M.D.

Case of Primary Reticuloendotheliosarcoma of the Corpus Uteri (Su una osservazione di reticolo-endotelio-sarcoma primitivo del corpo uterino). Carlo Avanzini. *Arch. ital. pat. Clin. Tumori*, 1958, 2: 196.

The patient was a 29 year old married woman with a history of one abortion and 2 normal pregnancies, an appendectomy at 15 years of age, and, recently, removal of polyps from the uterus.

On the author's service 2 polyps were removed and the uterine cavity was curetted. The removed tissues histologically demonstrated the presence of angioreticulosarcoma.

Twelve days later a total hysterectomy and bilateral adnexectomy were performed. Fifteen days after this last operation the patient was discharged in excellent physical condition.

Macroscopically the orange-sized friable mass of the tumor was broadly attached to the wall of the isthmic portion of the uterus. Histologically the mucosa of the endometrium was found to be widely infiltrated with the proliferating neoplastic tissue which had involved the myometrium more or less deeply. The neoplastic architecture consisted of alveolar, irregularly distributed tumor cells in a stroma of varying thickness and in a rather advanced state of hyaline degeneration. In places the tumor tissue had become necrotic with extensive extravasation of blood.

The tumor cells presented a definite connective tissue aspect and the individual cells were intimately connected by very fine filaments of protoplasm, which with the Mallory stain and silver impregnation method disclosed its reticular nature. The nuclei of these cells were rounded or oval, the chromatin was finely distributed and powderlike with finely granular appearance in places; in other places the chromatin was collected in pseudonuclear structures. Some of the cells were of larger size and there were frequent exemplars of karyokinesis.

The findings here recorded, together with the evident tendency of the tumor cells to seek vascular connections, left no doubt as to the reticuloendothelial character of the new growth.

The isolated and independent etiologic concept of this tumor as first promulgated by V. Goormaghtigh has since been enlarged to include many etiologically related neoplastic processes, all appearing as hyperplastic or anaplastic growths of the embryonic mesenchyma.

This instance of reticuloendotheliosarcoma, arising in the endometrium of the uterus, is added to the approximately 30 reports which have already appeared in the literature.

—John W. Brennan, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Ovary Remaining After Hysterectomy (L'ovaire restant après hystérectomie). Paul Funck-Brentano and Jacques de Thomasson. *Rev. fr. gyn. obst.*, 1958, 53: 217.

It is desirable for either one or both ovaries to be left in situ during hysterectomy. This conclusion is based on a study of 303 private and 277 hospital patients. Neither age nor microcysts are indications for castration or resection of the ovaries. If the microcysts were not accompanied by any pathologic manifestation before intervention, the organ should be conserved. Any ovarian cyst, having reached a certain size, should be removed, however, because of the potential complications it might cause, but bilateral castration is not required. Solid tumors of the ovaries and infectious processes in the adnexa are definite indications for castration. Hydrosalpinx in a young woman, provided it is certain that it does not conceal a tubal epithelioma, should be treated expectantly.

Endometriosis of the genital tract, even when it has spread to the serous coat of the peritoneum, should be treated with androgens provided the ovarian cyst is not too large. By contrast, endometriosis that has spread to the intestinal tract requires removal of both ovaries.

Cystic degeneration of ovaries left in situ during hysterectomy took place in 10 of 580 patients (1.72 per cent) and cancerous degeneration in 1 out of 580 (0.17 per cent). —*Sidney Smedresman, M.D.*

EXTERNAL GENITALIA

Enterocele (Les élytrocèles). P. Brocq. *Sem. hôp. Paris, Ann. chir.*, 1958, 12: 143.

The presence of enterocele is frequently missed at the time of vaginal examination unless specific steps are taken to determine its presence. Accordingly, any plastic procedures designed for the treatment of vaginal relaxation will fail if an unrecognized enterocele exists and is not specifically treated. Steps in the diagnosis of enterocele are outlined. Also, the authors' technique for the repair of enterocele is illustrated. It is suggested that the repair be done in two steps, preferably at the same sitting. The first step consists of the isolation of the enterocele sac according to standard procedure, ligation of the uterosacral ligaments, and repair of the pelvic floor. The second step consists of the abdominal isolation and either excision or ligation of the enterocele sac.

It is further recommended by the authors that in routine abdominal surgery, the pouch of Douglas should be systematically examined, and ligated if it is found to be at all deep, since a deep cul-de-sac predisposes to herniation of the intestine. Such a procedure will prevent the formation of enterocele.

—*D. N. Danforth, M.D.*

Three Cases of Malignant Change in Endometriosis, Including 2 Cases Arising in the Rectovaginal Septum. H. P. Ferreira and S. G. Clayton. *J. Obst. Gyn. Brit. Empire*, 1958, 65: 41.

Three interesting cases of adenocarcinoma of the endometrium, thought to have arisen in endometriomas, are described. Two of these occurred in isolated lesions of the rectovaginal septum. The possibility that the latter arose in foci of vaginal adenosis is mentioned, but thought to be improbable.

—*M. Leon Tancer, M.D.*

MISCELLANEOUS

The Anatomofunctional Interdependence Between the Female Sex Organs and the Suprarenal Steroids (Aspetti di interdipendenze anatomo-funzionali fra apparato sessuale femminile e steroidi surrenalici). Carlo Luraschi. *Ann. ostet. gin.*, 1957, 79: 213.

Sixteen female guinea pigs and 16 female albino rats comprised the experimental material for this study. Four animals served as controls.

Four animals were given daily intramuscular injections of prednisone (meticorten), 4 daily intramuscular injections of prednisolone (meticortelone), and 4 daily intramuscular injections of both substances. The period of treatment was 7 days for one animal of each group, 14 days for another, and 28 days for the remaining 2 animals of each group. Twenty-four hours after the last injection the animals were sacrificed and the ovaries and uterus were subjected to histologic study. The discussion of the results obtained with this technique is accompanied by 16 photomicrographs. Since the animals treated for 28 days exhibited the most marked findings after the abdomen was opened, only their tissues were chosen for the histologic study.

No essential difference as regards the character or intensity of the effect produced by the two preparations (prednisone and prednisolone) was noted, but there was a noticeable difference between the effect in the guinea pigs and in the albino rats. In the guinea pigs findings referable to a luteinizing influence predominated in the uterus. The endometrium showed numerous, tortuous glands which were filled with secretion, the nuclei of the cylindrical cells were displaced toward the base of the cell, and there was beginning desquamation.

In the rats the modifications were of an estrogenic type. There was hypertrophy and hyperplasia of the muscular strata, intense stromal reaction, and the epithelial cells were rather high and cylindrical in shape.

In the ovaries of the guinea pigs there were large numbers of follicles in various stages of maturation and practically without luteinic transformation; the influence of the injections (of prednisone or prednisolone) were predominantly of an estrogenic type.

In the ovaries of the rats the change could be described as one of massive luteinization; there was an evident push toward maturation of the follicles and the precocious formation of a corpus luteumlike structure.

The author believes that these results and those reported elsewhere show a direct mechanism for affecting the ovaries and uteri of both these species, although as yet there is no explanation for it.

—*John W. Brennan, M.D*

Culdocentesis at the Jackson Memorial Hospital, 400 Cases. Robert L. Crews, Fred D. Holford, and James Henry Ferguson. *Am. J. Obst.*, 1958, 75: 914.

Gynecologists frequently see patients with pelvic pain and irregular vaginal bleeding in whom the diagnosis following examination is not obvious. These cases tax the diagnostic acumen of any physician, and as a result many expensive and time-consuming procedures are often performed. The history and physical findings in such cases may at times be thought to indicate exploratory operation. Sometimes the operative findings justify the procedure. At other times it is found that conservative therapy would have been more appropriate. In some instances it may be found that the delay in operating has unnecessarily jeopardized the patient. In such difficult cases the authors have found that culdocentesis is of value in providing an accurate, safe, and quick method of learning the pathologic conditions present, so that proper therapy can be instituted without delay.

The procedure is a simple one, and is for the most part performed in the emergency room by the house staff without supervision of any of the attending staff. The details of the method are described and illustrated.

The procedure appears to be without complications even in inexperienced hands.

The accuracy of culdocentesis in diagnosing hemoperitoneum in this series was 96 per cent. It is especially dramatic in the diagnosis of ectopic pregnancy, when a delay in surgical therapy is not desirable. —*E. Elliott Lazarus, M.D.*

Arteriovenous Fistulas of the Uterus and Adnexa; An Arteriographic Study. ULF BORELL and INGMAR FERNSTRÖM. *Acta radiol.*, Stockh., 1958, 49: 1.

PELVIC ARTERIOGRAPHY was carried out in 517 women; 345 of these had a gynecologic disease and 172 were pregnant. Veins were filled with contrast material in 45 cases.

The films were considered to be projected in the arterial phase when arteries were demonstrated and in the capillary phase when the entire uterus was visible.

Contrast filling of the uterine or ovarian veins during the arterial phase was considered to be diagnostic of an arteriovenous fistula involving the uterine or ovarian blood vessels. Additional findings of diagnostic value were more rapid filling and emptying of the arteries running to the fistula as compared to other arteries in the pelvis, and dilatation of veins carrying blood away from the fistula.

In only 2 of the 345 cases of gynecologic disease in this series, were veins demonstrated. In the obstetric cases, however, veins were visible in 25 per cent.

The number of cases in which veins were visible varied in the different groups of pregnancy, being smallest in the group of normal intrauterine pregnancy (16 per cent). In the majority of cases in the latter group small veins in the uterine wall near the site of attachment of the placenta were filled with contrast medium when arteries were no longer visible.

Veins filled in about a third of the cases of ectopic pregnancy or miscarriage. Not infrequently they were filled toward the end of the arterial phase. In 3 cases of ectopic pregnancy, however, they were visible early in the arterial phase, which suggested the presence of a large arteriovenous fistula.

Veins were also contrast-filled in the arterial phase in cases of placental tumor. In 1 case of chorioepithelioma they were visible early in this phase.

The principal factor concerned in the origin of the abnormal arteriovenous communication in the cases of ectopic pregnancy, miscarriage, missed abortion, and hydatidiform mole was probably the necrosis of villi, blood being thereby shunted from the artery to the vein without being checked by the villi. In the case of chorioepithelioma, the malignant trophoblastic cells probably also injured the walls of an artery and vein which resulted in an arteriovenous fistula.

It has hitherto not been known that necrosis of villi can give rise to an arteriovenous fistula, the concensus of opinion being that the origin of the lesion is congenital, traumatic, or from a tumor.

A necrotic placenta with an arteriovenous fistula produces symptoms in the form of pain which ceases after removal of the placenta. Pelvic arteriography proved to be of diagnostic value in these cases.

In contrast to congenital or traumatic arteriovenous fistulas, those resulting from necrosis of villi may apparently close spontaneously.

—*Charles Baron, M.D.*

Mesodermal Mixed Tumors of the Female Genital Tract. CLAUD W. TAYLOR. *J. Obst. Gyn. Brit. Empire*, 1958, 65: 177.

GYNECOLOGISTS and pathologists will be interested in this unusually complete and scholarly survey of the entire subject of mesodermal mixed tumors of the female genital tract. The author is a distinguished pathologist who derives his data from a study of 40 cases of this relatively rare group of tumors. His discussion includes comments on the gross anatomic appearance of the tumors, their tissue components, etiology and histogenesis, their mode of spread, and prognosis. The bibliography is most thorough.

—*M. Leon Tancer, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Studies in Prolonged Pregnancy. C. H. G. MACAFEE and G. BANCROFT-LIVINGSTON. *J. Obst. Gyn. Brit. Empire*, 1958, 65: 7.

A SERIES of 386 cases of prolonged pregnancy were studied. This represented an incidence of 21 per cent and included pregnancies exceeding 287 days. Of these 386 pregnancies, 143, or 7.7 per cent, exceeded 294 days. This incidence corresponds closely to that of other published reports.

It is suggested that mechanical difficulty plays an important part in prolonged pregnancy. This seems to be more important than hypoxia, which this study fails to support. Also the appearance of meconium seemed to be a danger which has been over-emphasized. The reasons for this conclusion are as follows:

1. The external evidence of meconium depends on the closeness of the application of the fetal head to the lower uterine segment and maternal pelvis tissues.
2. Its amount and character are influenced by the volume of liquor amnii, the speed with which it drains, and the total amount of meconium passed by the fetus.
3. It is impossible in most cases to determine when the meconium was passed by the fetus.
4. Sudden intrauterine death is in many cases associated with an unstained liquor amnii.

As to the treatment of prolonged pregnancy, routine induction of labor, 5 to 7 days after the calculated date, represents meddlesome midwifery. Conservatism is recommended, with emphasis on physical factors rather than hypoxia or placental insufficiency.

—*Harry Fields, M.D.*

Fluctuation of Plasma Fibrinogen Levels in Healthy and Toxemic Women at the Time of Birth (Schwankungen des Fibrinogengehaltes waehrend der Geburt bei gesunden und toxaemischen Frauen). P. VARA. *Geburtsh. & Frauenh.*, 1958, 18: 432.

A STUDY was made of the plasma fibrinogen content just before delivery, immediately after delivery, and on the fourth day postpartum. The patients included 34 normal women, 33 women with toxemia (10 of whom had eclampsia), and 19 women with placental separation (10 of whom had toxemia). In all cases the fibrinogen level was determined colorimetrically.

In normal patients the familiar increase in fibrinogen levels was noted during parturition. In the presence of toxemia, fibrinogen levels tended to fall during and after delivery. When placental separation occurred, fibrinogen levels were very low postpartum, being significantly lower when toxemia was an added complication. With emptying of the uterus in placental separation, fibrinogen rapidly rises. A summary of mean values obtained in the various circumstances is to be found in Table I.

—*Warren R. Lang, M.D.*

Renal Glomerulotubular Mechanisms During Normal Pregnancy; Glomerular Filtration Rate, Renal Plasma Flow, and Creatinine Clearance. RUSSELL R. DE ALVAREZ. *Am. J. Obst.*, 1958, 75: 931.

THE IMPORTANCE of the kidney in the normal physiology of pregnancy as well as its various pathologic states has long been known. Its exact role has not been clear because of the absence of any precise clinical methods for testing renal function tests. Renal function depends not only on the kidney itself but on numerous extrarenal factors. The introduction of more precise tests, such as inulin clearance, para-aminohippurate clearance, and creatinine clearance, has provided more precise information regarding renal function. Previous studies indicated that the glomerular filtration rate was increased in early pregnancy and that this increase persisted. Renal plasma flow also increased, dropping just before term.

The present study deals with the serial determination of inulin, para-aminohippuric acid, and creatinine clearances in a group of normal pregnant women. Nine patients were followed up throughout the study and several others were studied during part of the study, and in addition spot determinations on other normal patients were procured. The studies were done on all ambulatory patients and by standard techniques.

The studies indicated that in the first trimester of pregnancy the glomerular filtration increased, the renal plasma flow increased, and the filtration factor was reduced. The creatinine clearance was increased only during the first trimester of pregnancy, returning to normal following this. In the second trimester of pregnancy the glomerular filtration rate declined as did the renal plasma flow. In the last trimester the glomerular filtration rate was found to be slightly below the average of the nonpregnant state. Renal plasma flow, likewise, was below that for the normal nonpregnant patient. The filtration factor, on the other hand, rose in the third trimester.

In view of the numerous variables involved it is difficult to explain these changes at the present time.

TABLE I.—MEAN VALUES OF FIBRINOGEN

	No. of cases	*39th Week of gestation*	*During labor*	*Immediately postpartum*	*Fourth postpartum day*
Normal women	34	533	510	578	527
Mild toxemia	23	551	497	514	488
Placental separation and toxemia	10			421	604
Placental separation	9			495	610

It is conceivable that the high circulating chorionic gonadotropin in early pregnancy might cause dilatation of the afferent glomerular arterioles with an increase in the intraglomerular pressure. This would account for both the increased glomerular filtration and the increased renal plasma flow. It would also account for the increased creatinine clearance and the reduced filtration factor. The increased cardiac output noted in early pregnancy is also a factor. In the latter part of pregnancy the increased cardiac output may be absorbed by the demands of the placenta and fetus which would permit the renal circulation to return to a normal or near normal status.

—*James F. Donnelly, M.D.*

One Radiograph to Exclude Placenta Praevia. A. A. Earn, J. L. Freer, and D. R. Cairns. *Lancet*, Lond., 1958, 1: 828.

The modern practice of watchful expectancy in the event of vaginal bleeding associated with placenta previa frequently causes the patient to spend a considerable period of time in the hospital until the pregnancy has reached a stage at which it can safely be interrupted. This study was carried out in order to determine if a simple technique could be developed whereby the location of the placenta could be determined accurately and with ease, and thus permit many of these patients to return home. A total of 107 patients were examined roentgenographically during a 2.5 year period, from January, 1953 to June, 1956. Three roentgenographs were made, including a lateral view of the uterus, the pelvis in the erect position, and the pelvis in the semierect position. In addition, indirect placentography was done.

In 90 of the 107 patients investigated the placenta was located accurately in the upper portion of the uterus, and these patients were returned home. The remaining patients were considered to have placenta previa and were kept under close medical observation, usually in the hospital.

—*James F. Donnelly, M.D.*

Malignant Forms of Infectious Hepatitis Occurring During Gestation (Les formes malignes de l'hépatite virale au cours de la gestation). E. Houel, M. Fabregoule, R. Gares, and R. Bourdon. *Sem. hôp. Paris*, 1958, 34: 1037.

The authors analyze 22 cases of severe infectious hepatitis during gestation and emphasize the following points:

1. Icterus was seen in only 3 of the 22 cases.
2. In the clinical picture of icterus nervous symptoms are dominant with the presence of terminal hepatic coma.
3. The hemorrhagic syndrome appears more often during delivery.

The laboratory findings are:

1. Hypoglycemia is often very marked.
2. Hypocholesteremia is present contrary to the usual hypercholesteremia of normal pregnancy.
3. Hypoproteinemia is found, with a reduction of albumin, of alpha globulin, and an increase of beta and gamma globulin.
4. Leucocytosis (25–30,000) with an average of 86 per cent of neutrophils is a fairly constant picture.

The anatomopathologic lesions in the mother are always those of an acute yellow atrophy of liver, but in the fetus, which usually dies, the liver is uninjured. The metabolic disturbances seem to explain the death of the fetus "in utero" and the occurrence of premature delivery.

Hepatitis is believed to be a virus infection with benign and malignant forms. The following factors predispose to the development of malignant forms during pregnancy:

1. Multiparity. No case was observed by the authors in primiparas.
2. Malnutrition, common in the authors' cases among the Arab population.
3. Intestinal infections resulting from poor hygiene.
4. The beginning of the third trimester of pregnancy (19 of the authors' 22 cases). This can be explained by marked changes at that time in the endocrinal equilibrium of pregnant women.

In conclusion the authors stress the failure of all therapeutic measures, such as antibiotics, glutamic acid, cortisone, and its derivatives.

Interruption of the pregnancy is not beneficial for mother or fetus. —*M. Srokowski, M.D.*

The Management of Uterine Myomas During Pregnancy (Behandlung des myomatoesen Uterus in der Schwangerschaft). H. W. Kayser. *Geburtsh. & Frauenh.*, 1958, 18: 295.

The author reports 28 myomas of significant size that were discovered in 7,937 pregnant patients, an incidence of 0.45 per cent. This figure approximates the usually reported range of 0.5 per cent to 0.6 per cent. Contrary to the usual opinion, the author believes that myomas complicating pregnancy cannot be disregarded. Of the 7,937 pregnancies, 1,716 ended in abortion; 8 of these were complicated by myomas. Fourteen of the 28 patients with myomas (50 per cent) required some form of operation, including 8 hysterectomies done at the time of birth or immediately afterwards. The perinatal mortality of babies born of women with myomas was 15 per cent.

The undesirable effects of myomas in pregnancy are related to two main factors: size and location. Myomas which are smaller than an apple usually cause no difficulty. Intramural myomas larger than this inevitably become necrotic and surgical removal is advocated during midpregnancy. It is probably wise not to remove such a myoma if infection is present clinically. —*Warren R. Lang, M.D.*

LABOR AND ITS COMPLICATIONS

The Effect of Rupture of the Membranes upon the Length of Labor. M. N. Bainbridge, W. C. W. Nixon, and C. N. Smyth. *J. Obst. Gyn. Brit. Empire*, 1958, 65: 189.

There is a growing interest in the effect of fetal membranes on the course of labor and upon fetal welfare during the birth process.

All vaginal deliveries between 1953 and 1956 at the University College Obstetric Hospital in London were studied as to the effect of rupture of the membranes upon the length of labor. There were 2,324 primiparous and 1,426 multiparous patients.

Labor was timed from the first painful contraction.

Postmaturity represents 8 or more days after the expected date of delivery. Prematurity is determined by the weight of the infant (less than 2,500 gm.).

Fetal distress is defined as a fetal heart rate of more than 160 or less than 100 per minute, or irregularity in rhythm.

Relative disproportion is based almost entirely on clinical assessments.

Pre-eclamptic toxemia is based purely on blood pressure increase.

The patients were divided into four groups:

1. Those whose labors were surgically induced.
2. Those whose membranes ruptured spontaneously before the onset of labor or at the same time as the first painful contraction.
3. Those whose membranes ruptured during the first stage of labor.
4. Those whose membranes ruptured at full dilatation or during the second stage of labor.

Each of the four groups were studied for length of first and second stage of labor, age of the mother, weight of the baby, maturity, and postpartum hemorrhage. Also the incidence of forceps delivery, manual removal of placenta, relative disproportion, abnormal presentation, fetal distress, stillbirths, and pre-eclamptic toxemia were investigated.

Analysis of the statistics revealed that labors longer than average were associated with intact membranes, and when the labors were shorter than average, the membranes had been ruptured. The higher fetal distress rate in patients whose labors are induced, seems to be due to the condition for which the induction was performed, and not to the induction itself. Otherwise fetal distress was associated with longer labors. No evidence could be found to prove that rupture of the membranes before the onset of labor increased the incidence of genital sepsis. —*Harry Fields, M.D.*

PUERPERIUM AND ITS COMPLICATIONS

Puerperal Morbidity Associated with Retained Membrane and the Prophylactic Instrumental Removal of the Latter Post Partum. HEIKKI TERÄSVUORI and EINAR SALOVAARA. *Ann. chir. gyn. fenn.*, 1958, 47: 29.

MOST TEXTBOOKS and authors consider retention of the membranes *per se* as an insignificant complication and one in which no specific intervention is required. During the 10 year period from 1946 to 1955, there were a total of 20,000 deliveries at the Maternity Hospital of Tampere. Total or partial retention of the membranes was confirmed in 958 patients, or 3.3 per cent. The group could be divided into two subgroups; the first contained 153 patients who had retained membranes which were not suspected. The diagnosis was established only when the patient passed membranes sometime during the puerperium. The second group consisted of 804 cases in which the retention of membranes was clinically suspected and confirmed by instrumental evacuation. There was an additional group of 177 patients in whom retention of the membranes was suspected and in which instrumental evacuation was carried out but no membranes were found. The instrumental evacuation was performed on the second day postpartum without anesthesia, and by means of an ovum forceps and a large curette. There was only one case in which a complication arose (severe hemorrhage), which was associated with a placental polyp.

Reviewing the morbidity noted in these two subgroups, the authors found considerably higher incidence of morbidity in the group of patients who expelled the membranes spontaneously than in those who were subjected to the instrumental removal of membranes. The morbidity in the latter group was only slightly higher than in the patients who had normal expulsion of the placenta and membranes in the remaining clinic population.

—*James F. Donnelly, M.D.*

NEWBORN

The Relationship between the Fetal Amniotic Fluid and Plasma and the Biologic Unity Thereof; Some Practical Deductions (Ciclo amnioplasmático y unidad biológica fetolíquido amniótico; deducciones prácticas). L. GUBERN SALISACHS and A. MARQUES GUBERN. *Rev. españ. obst.*, Valencia, 1957, 16: 393.

THE AUTHORS have reviewed the high spots in the literature on congenital anomalies and the mechanism of amniotic fluid production and reabsorption. The authors recommend early diagnosis of anomalies of the intestinal and urinary systems, with particular emphasis on the former. They point out that high intestinal obstruction in the fetus will inevitably produce hydramnios, and this is listed as one of the diagnostic clues pointing toward possible congenital anomaly. The authors emphasize the value of x-ray diagnosis and the information to be derived from intubation of the esophagus, trachea, and rectum.

—*Howard Ulfelder, M.D.*

MISCELLANEOUS

Maternal Health and Congenital Defect; A Prospective Investigation. ALISON D. MCDONALD. *N. England J. M.*, 1958, 258: 767.

THIS STUDY was carried out at the Watford Maternity Hospital and St. Albans City Hospital in London. Some of the mothers were delivered at other hospitals in the vicinity or at home. Of the original women interviewed, 3,144 were subsequently followed up. Seventy-two women were known to have aborted and the remainder were untraced. The interview took place shortly after they were booked for maternity care. Only defects which were present at birth or shortly thereafter were recorded. All but 12 of the 98 infants which were stillborn or died during the neonatal period were autopsied. The data concerning the 72 abortions and the 3,179 infants were analyzed. This included 68 spontaneous abortions, 74 perinatal deaths, 50 cases of infants with major congenital anomalies, and 3,059 cases of normal infants. There were 72 additional infants with minor anomalies. The total incidence of congenital anomalies was 3.8 per cent; on the other hand, the incidence of major anomalies was 1.5 per cent, a figure which is comparable to other reports in the literature. The gross incidence of prematurity was 6.5 per cent, but if the prematurity was associated with major defects, multi-

ple births, and induced labor it was not counted, and the incidence was reduced to 3.7 per cent. The incidence of abortion, stillbirths, neonatal deaths, and major anomalies appeared to be lower in the young mothers and those of second parity, and was high in mothers over the age of 40 years and in those of higher parity. If the 6 cases of mongolism were excluded the association of the upper age groups with major anomalies tended to disappear.

Occupation seemed to bear some relationship to congenital anomaly. There was a slight but not significant increase in anomalies among the women who worked for 30 or more hours per week. The women employed in laundries appeared to have a higher incidence of major defects than was noted in some of the other occupations recorded. It was also noted that the mothers whose work required heavy lifting or pulling had a higher incidence of major congenital anomalies than mothers with less strenuous occupations.

Acute illness without fever was associated with a high incidence of perinatal mortality. However, acute illness with fever was associated with a higher incidence of abortion, perinatal death, and major anomalies. The majority of febrile illnesses consisted of upper respiratory infections. Chronic disease appeared to be associated with a high incidence of perinatal mortality. The children of mothers with active or quiescent tuberculosis had a higher incidence of major anomalies, although there were only 3 infants in 31 pregnancies that were involved.

Maternal anemia was higher in all three of the abnormal groups as compared with the normal. However, in comparing the individual groups the perinatal deaths were the only ones in which anemia appeared to be significant. Women who exhibited vaginal bleeding early in pregnancy and continued to carry the pregnancy had a much higher perinatal mortality than those who had no bleeding. On the other hand, there appeared to be no association between congenital anomalies and vaginal bleeding in early pregnancy.

This type of study seemed to offer some advantages as well as disadvantages. The incidence of congenital defects is so low that a rather large number of women must be interviewed in order to obtain significant data. On the other hand, the prospective method of study is valuable because the data recorded are unbiased and reasonably consistent.

—*James F. Donnelly, M.D.*

Experimental Studies on the Role of Histamin in Implantation of the Fertilized Ovum. M. C. Shelesnyak. *Bull. Soc. Roy. belg. gyn. obst.*, 1957, 27: 521.

Preliminary evidence is presented to support the contention that histamine is involved in, and probably necessary to, the formation of decidua. With one horn of the partially fused rat uterus as a control, it was found that the local application of antihistamine prevented decidual reaction and implantation. Further, the local application of histamine induced decidual reaction. It is tentatively concluded that histamine plays a significant role in normal implantation.

—*D.N. Danforth, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Roentgen Examination of the Suprarenal Glands. STIG FAGERBERG. *Acta. Radiol.*, Stockh., 1958, 49: 218.

THE AUTHOR reviews the methods of roentgen diagnosis of small expanding lesions of the suprarenal glands. He points out that there is a varying degree of space between the gland and its capsule, filled with varying amounts of fat and connective tissue.

Misleading estimates of the size of the suprarenal gland are possible by the present diagnostic methods. The author performed aortography with good diagnostic results in several cases of large suprarenal tumors.

He considers retroperitoneal pneumography to be the best method, at present, of demonstrating expanding lesions of the suprarenal glands; the method does have limitations, however. An apparently normal suprarenal space may enclose an enlarged gland, and an apparently slightly enlarged space may be associated with a perfectly normal gland. Retroperitoneal pneumography demonstrates the suprarenal space with its contained gland, fat, and connective tissue, but it is futile to attempt to determine the size of the gland precisely by this method.

—David Rosenbloom, M.D.

Renal Angiomyolipomas and Tuberous Sclerosis. JACK N. TAYLOR and KLAUS GENTERS. *J. Urol.*, Balt., 1958, 79: 685.

THIS IS an excellent study of rather esoteric subject matter. Angiomyolipomas, or hamartomas, of the kidney are benign tumors occurring singly or bilaterally. A great percentage are asymptomatic and at autopsy 50 per cent of the cases were shown to occur in patients suffering from tuberous sclerosis. This is a disease entity characterized usually by two or more of the following symptoms: mental retardation, epilepsy, adenoma sebaceum, phacoma (optical retina and/or benign tumors), and multiple mixed tumors of the kidney, and there may be a familial history of the disease. Roentgenographically, calcifications in the brain, increased patchy densities in the skull, cystlike foci in the phalanges, and changes in the shafts of the metatarsals and metacarpals are observed.

Three case histories are presented and discussed. This article is of value in that it reviews a fairly rare disease entity and points out that hamartoma must be considered when pyelograms suggest polycystic disease. Tuberous sclerosis and renal angiomyolipoma must both be considered when either is diagnosed.

—John R. Herman, M.D.

Embryonal Mixed Tumors of the Kidney in Childhood (Die embryonalen Mischgeschwuelste der Nieren im Kindesalter). W. H. BRINKMANN. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 156.

TWENTY PATIENTS with Wilms' tumor were observed at the surgical clinic of the University of Bonn, in Germany, during the period from 1928 to 1957. Seven were adjudged inoperable and 13 underwent nephrectomy. Histological examination of the kidney in the 13 cases showed that 10 were instances of embryonal mixed tumor and 3 were true sarcomas.

Two of the patients survived for more than 5 years. One had a mixed tumor the size of a hen's egg which had neither perforated the renal capsule nor developed metastases. In the other child the neoplastic process had metastasized to para-aortal lymph nodes which could not be removed. Postoperative irradiation therapy was carried out, and the patient died 11 years later when a soldier in North Africa.

The lengthy survival period in the last patient supports the hypothesis of a biologic factor—a capacity for healing following palliative resection, even in the presence of metastases.

The author believes the best form of treatment of Wilms' tumor is a combination of surgery and irradiation therapy.

—John W. Brennan, M.D.

BLADDER, URETHRA, AND PENIS

Further Observations on Excretory Cystometry. A. ESTIN COMARR. *J. Urol.*, Balt., 1958, 79: 714.

THE PURPOSE of this study was to: (1) learn what pattern relationships existed between retrograde and excretory cystometry, (2) learn what the pattern relationships were just prior to the bladder's becoming catheter-free for better prognostication of the future of an imbalanced bladder, (3) learn if excretory cystometry is of value among hypocapacity bladders, (4) learn if permitting the bladder to fill up to 1,000 c.c. during a 2 hour excretory cystometry period will prevent automaticity because of overdistention, and (5) learn how the catheter-free states were obtained and the length of time required.

Fifty-two patients with traumatic cord lesions were studied. Forty-eight patients had upper motor neuron bladders, whereas 4 had lower motor neuron bladders. None of the patients studied were in spinal shock. Excretory cystometry was usually performed first, followed by retrograde cystometry within 1 to 4 days later. Both methods were performed routinely every 3 or 4 weeks.

Retrograde cystometry was performed with a size 20 whistle tip catheter after the bladder had been emptied. The Y tube was attached to the catheter; from one limb of the Y tube the tubing led to the Lewis cystometer. Through the other limb of the Y tube distilled water at room temperature entered in a continuous flow at the rate of 25 c.c. per minute. This instillation was terminated either by a detrusor contraction which ejected the catheter (autonomic hyperreflexia), manifested by blood pressure hypertension or at a volume of 400 c.c. Excretory cystometry with a whistle tip catheter was performed as follows:

The patient was instructed to drink one glass of water hourly from 6:00 A.M. until the scheduled time for cystometry. The fluid intake was continued during cystometry. A size 20 whistle tip urethral catheter was

gently introduced and the bladder was emptied. Strain, Credé's method, or other extrinsic methods were not used to empty the bladder as they might set off reflex activity. With the tip in the bladder, the catheter was then connected to the Lewis cystometer in the usual manner. The intravesical volume was supplied by the patient's excreted urine. Cystometry was continued until the catheter was ejected, but it was terminated after 2 hours if the catheter was ejected by a voiding contraction of the detrusor or if a hypertensive autonomic response was noted. Four hundred cubic centimeters were accepted as the normal capacity in this study.

The following patterns were observed: 28 capacities below 400 c.c. in both types of cystometry; 27 capacities below 44 c.c. with retrograde cystometry and capacities above 400 c.c. with excretory cystometry; and 48 capacities above 400 c.c. in both types of cystometry. Only one pattern was found among the lower motor neuron bladders; namely, capacities above 400 c.c., in both types of cystometry. Among 23 patients with upper motor neurons just prior to becoming catheter-free, 9 showed capacities below 400 c.c. with retrograde and excretory cystometry. Ten patients had capacities below 400 c.c. with retrograde, and above 400 c.c. with excretory cystometry. Prior to becoming catheter-free, the patients with lower motor neuron bladders showed hypercapacity with both the retrograde and excretory methods. The tests showed that in the group of patients with a capacity below 400 c.c. with both retrograde and excretory cystometry, all except one had a greater capacity with excretory cystometry. Twelve of 31 patients became automatic despite elevated capacities which were found at one time or another during routine testing of 2 hour excretory cystometry. The capacities ranged from above 400 c.c. to over 1,000 c.c. Among the group of patients with upper motor neuron bladders 17 became catheter-free spontaneously within 4 to 26 months following injury. Ten patients became catheter-free following various blocking procedures within 5 to 24 months. Four patients became catheter-free on transurethral resection within 11 to 30 months. Among the patients with lower motor neuron bladders 2 became catheter-free spontaneously, 3 and 6 months after injury. One patient became catheter-free 11 months after injury following transurethral resection. Completeness or incompleteness of the spinal cord lesion did not seem to play a role in this series of cases.

This study verifies the fact that upper motor neuron bladders show less capacity with the retrograde than with the excretory method. This marked difference in capacity is absent in patients with lower motor neuron bladders. Although truer capacities can be obtained with excretory than with retrograde methods, the physiologic capacity, unimpeded by the stimulus of the indwelling catheter, can be determined only at the bedside when the urinary residual is tested.

While cystometry is a valuable adjunct, one must compare its findings with the results of the capacity residual test, which is performed without a catheter and at bedside. Each bladder will develop its own "intrinsic physiologic capacity" over which we have no control. It is incorrect to presume, as many do, that most balanced reflex bladders show hypocapacity, while true lower motor neuron bladders show hypercapacity with all methods of study. Although hypocapacity may be present with both retrograde and excretory cystometry, relatively larger capacities are found with the excretory method.

—Ray C. Johnston, M.D.

Stenosis of the Vesical Neck in Early Childhood (Die Blasenhalsstenose des fruehen Kindesalters). E. Zapp. *Muench med. Wschr.*, 1957, 99: 1761, 1824.

Stenosis of the vesical neck is infrequently discussed in the German literature but there are many references to it in the Anglo-American and French literature. The condition is sometimes referred to as fibrosis of the vesical neck, submucous fibrosis of the vesical outlet, bladder neck obstruction, and in the French literature as "hypertrophie congenital du col vesical."

Clinically, this condition is usually detected in a search for the cause of infections of the urinary tract or of increasing renal failure. Four cases are reported. The first is that of a male infant 9 days old. The significant findings were proteinuria, pyuria, diarrhea, and vomiting. The child died and at autopsy stenosis of the vesical neck, marked thickening of the bladder wall, tremendous dilatation of the ureters, and pyelectasia were found. The second case was a 13 month old boy who entered the hospital because of pyrexia. The significant findings were proteinuria, pyuria, and anemia. During his stay in the hospital uremia developed, the nonprotein nitrogen rising to 105 mgm. per cent. Urologic investigation revealed a contracted vesical neck, 100 c.c. of residual urine, hydroureter, and hydronephrosis. A cystotomy was performed and the internal sphincter partially excised. The child at first improved but then its condition worsened. Ten weeks later the elongated right ureter was partially excised and reimplanted into the bladder. Eight days after the last operation the patient succumbed. At autopsy hydronephrosis, extensive pyelonephritis, hydroureter, and hypertrophy of the bladder wall were found. Case 3 was an 8 months old infant who was admitted to the hospital because of fever and pallor. The child on examination had hypertension, albuminuria, pyuria, 200 to 220 c.c. of residual urine, hydronephrosis, and hydroureter. The right ureter was considerably dilated and elongated. At operation a 5 cm. section of the ureter was excised and the ureter was reimplanted in the bladder. A suprapubic cystotomy also had to be done. Seven months later the blood pressure was considerably lower but the child still had signs of diminished renal function. Case 4 was a 3 year old boy who entered the hospital because of urinary tract infection which recurred in a period of 2 months. The urine contained albumin and a large amount of pus. An intravenous urogram showed right hydronephrosis and dilatation of the right ureter. The nonprotein nitrogen was 67.1 mgm. per cent. There were 15 to 100 c.c. of residual urine. Administration of antibiotics and regular aspiration of residual urine by catheter brought notable improvement.

The etiology of vesical neck stenosis is not clear. It has been ascribed to achalasia, i.e., a vagosympathetic imbalance, to true hypertrophy of the musculature of the sphincter, or to inflammation.

Histologically, hyperplasia of the musculature of the internal sphincter or cellular infiltration of the muscle fibers is frequently seen. In 3 of the author's cases the histologic picture was as follows:

In one there was an increase in connective tissue and diminution of the muscular components. In the second case inflammatory elements were predominant. In the third case there was considerable alteration in the sphincteric musculature and cellular infiltration.

The clinical picture of vesical neck stenosis is quite characteristic. There is usually difficulty in emptying the bladder. The bladder, itself, becomes trabeculated and retains a considerable amount of residual urine. The ureters become dilated and there is pressure atrophy of the renal parenchyma. Renal function diminishes early and is due to tubular dysfunction. The patient, therefore, may become dehydrated and acidotic. Hypercalcemia and azotemia may occur suddenly. Urinary tract infection frequently supervenes and aggravates the clinical picture. The disease usually occurs in infants and in young children.

On physical examination the bladder is frequently palpable. The diagnosis is suspected in patients who have a distended bladder, overflow incontinence, and infected urine. Intravenous pyelography reveals hydronephrosis, distended calcyes, dilated ureters, and a trabeculated, large bladder. Cystography reveals reflux of the contrast medium into the ureters and kidneys.

In the differential diagnosis congenital anomalies, such as ureterocele, urethral valves, and strictures of the urethra, must be considered.

The treatment of stenosis of the vesical sphincter consists of resection of the vesical neck and the elimination of the urinary tract infection. In the management of renal insufficiency, cystotomy or nephrostomy drainage may become necessary. Particular attention must be paid to the electrolyte balance. Pediatricians must realize that stenosis of the vesical neck can be a serious disease with a grave prognosis. Early diagnosis is, therefore, imperative.

—*S. Richard Muellner, M.D.*

Primary Malignant Neoplasms in Vesical Diverticula (Neoplasie primitive maligne in diverticoli vescicali). A. CONFALONIERI. *Arch. ital. urol.*, 1958, 30: 428.

ONE CASE of primary intradiverticular vesical epithelioma is reported with a review of the literature on this subject.

The patient was a 62 year old man who for 2 years had to urinate once or twice during the night. For 3 months there had been attacks of pain in the left flank, especially after physical exertion. During one of these attacks hematuria with the passage of small clots was noted. The bleeding lasted for 3 days. Examination did not clarify the source of the bleeding but surgical intervention was decided upon.

At operation (epicystotomy) 3 diverticula were encountered; the openings into the bladder of 2 were on the right side, slightly above the ureteral aperture; the other opening was on the left side, above and laterally. The 2 diverticula on the right side were exposed. One of them contained infiltrating, partially sphacelated neoplastic tissue. The diverticulum on the left side was also exposed and cut away close to the bladder and the stump sutured. Circular resection of the sclerotic neck of the bladder was done and enucleation of an adenomatous nodule of the prostate. Three months later the patient returned to the author's service, this time with neoplastic infiltration of a fistula of the bladder. The patient died of cachexia in the course of the following month.

The author discusses the reasons for not performing total excision of the urinary bladder with ureterosigmoidostomy. The patient was not in physical condition to withstand such a procedure, and the author states that the radical procedure has not assured freedom from recurrence and metastasis.

The author emphasizes the necessity of comprehensive urologic study of patients in whom diverticulosis is suspected, and of bearing in mind the possibility of intradiverticular neoplastic disease in the presence of even minimal hematuric episodes.

—*John W. Brennan, M.D.*

GENITAL ORGANS

Prostatitis and Ankylosing Spondylitis. R. M. MASON, R. S. MURRAY, J. K. OATES, and A. C. YOUNG. *Brit. M. J.*, 1958, 1: 748.

SINCE IT HAS BEEN ARGUED that (1) Reiter's disease is a variant of rheumatoid arthritis, (2) ankylosing spondylitis is a variant of rheumatoid arthritis, (3) ankylosing spondylitis is a complication of Reiter's disease, and (4) ankylosing spondylitis is due to genital infection, it was clearly necessary to determine the incidence of genital inflammatory disease in the two latter groups. All cases were therefore examined for signs of chronic prostatitis. Fifty-four cases of ankylosing spondylitis were studied and compared with 86 cases of rheumatoid arthritis and 59 of Reiter's disease, a total of 199 cases, all male patients. Included in the ankylosing spondylitis group, were only the cases in which a confident clinical diagnosis had been made. All of the patients with rheumatoid arthritis had well established typical cases. The diagnosis of Reiter's disease was based on the finding of a nongonococcal urethritis associated with an arthritis of acute onset and a variable, often chronic, relapsing course. Conjunctivitis occurred in 24 of the 59 cases (40 per cent) and uveitis and keratodermia blennorrhagica in 6 cases (10 per cent) each. The main age of the ankylosing spondylitis group was 37.4 years, with a mean duration of disease of 10.1 years. The rheumatoid arthritis group had a mean age of 52.7 years, with a mean duration of 6.7 years; and the Reiter's disease group had a mean age of 42.2 years with a mean duration of 8.4 years.

As a part of the roentgenological survey the sacroiliac joints of all the patients were roentgenographed. Unequivocal bilateral sacroiliitis was recorded in 49 of the 54 patients (91 per cent) with ankylosing spondylitis. In the rheumatoid arthritis group unequivocal bilateral sacroiliitis was present in 7 of 86 cases (8 per cent). In Reiter's disease the figures were intermediate, bilateral sacroiliitis being recorded in 19 of 66 cases (35 per cent). In examining for the presence of chronic prostatitis, 5 samples of prostatic fluid were obtained by prostatic massage. These were

scrutinized by dark field microscopy for the presence of polymorphonuclear leucocytes in clumps. The diagnosis of prostatitis was made only on the findings of pus cells in clumps, with a minimum of 10 pus cells per high power field. No distinctive features were found in the pathological appearance of the prostatic fluids in the positive cases. The difference between the ankylosing spondylitis group, with an incidence of 83 per cent prostatitis, and the rheumatoid arthritis group, with 33 per cent, is highly significant. The high incidence in the Reiter's disease group is not surprising. The mean age of the rheumatoid arthritis group was some 15 years more than that of the spondylitis group, with a maximum incidence in the 45 to 64 decade, while the ankylosing spondylitis group has a maximum incidence in the 35 to 44 decade. The pattern of prostatitis in the ankylosing spondylitis group followed almost exactly the pattern of age distribution of the group. Moreover, the incidence in the rheumatoid arthritis group showed no trend in favor of the younger decades. Of the 15 patients with rheumatoid arthritis in the 35 to 44 decade, only 4 had prostatitis, an incidence of 27 per cent. In the same decade in the ankylosing spondylitis group 24 of the 25 patients (96 per cent) had prostatitis. It seems unlikely, therefore, that the difference results from differences of age. A similar examination of the relation of prostatitis to disease duration revealed no trend in favor of any such relationship that could account for this finding. The number of patients with no evidence of prostatic disease was small, except in the rheumatoid arthritis group, in which the incidence of sacroiliitis was not significantly different whether prostatitis was present or not. All 11 patients with ankylosing spondylitis with a normal prostatic fluid had unequivocal bilateral sacroiliitis, but none of the 4 patients who had Reiter's disease and normal prostatic fluid had changes in the sacroiliac joints.

Of 49 cases with ankylosing spondylitis and unequivocal bilateral sacroiliitis, 38 (79 per cent) had prostatitis, compared with an incidence in the whole group of 83 per cent. In the rheumatoid arthritis group 2 of 6 (33 per cent) had prostatitis, compared with 33 per cent in the whole group. These figures do not suggest that prostatitis resulted from sacroiliitis. In the Reiter's disease group 27 of the 59 patients (46 per cent) had had a previous attack of gonococcal urethritis, while the incidence in the ankylosing spondylitis group and the rheumatoid arthritis group proved to be low—5 of 54 (9 per cent) in the former group, and 4 of 86 (5 per cent) in the latter.

The association between prostatitis and ankylosing spondylitis is not a new finding. There is often, however, a failure to distinguish between Reiter's disease with a subsequent spondylitis and ankylosing spondylitis itself. Evidence that prostatitis is an associated phenomenon or etiologically related to ankylosing spondylitis is still not clear, and the interpretation of the data remains difficult. There is no proof that genital inflammation causes sacroiliitis. It is concluded that there is a true association between ankylosing spondylitis and inflammatory disease of the urogenital tract. —*Ray C. Johnston, M.D.*

The Superficial Inguinal Pouch and the Undescended Testis. PETER JONES. *Med. J. Australia*, 1958, 1: 239.

AN INTIMATE KNOWLEDGE of the normal anatomy of the superficial Camper's fascia and of Scarpa's fascia is essential to understand the degree and the diagnosis of this condition.

The superficial inguinal pouch is an areolar space lying beneath Scarpa's fascia and in front of the external oblique aponeurosis. There are many variations in size of this superficial inguinal pouch.

There are two main categories of undescended testes, those arrested in the line of normal descent and those that have diverged from it. Those which have diverged from it are known as ectopic testes.

The superficial inguinal ectopic testis is the most common variety. There are variants of this type. Some of them are differentiated by a short spermatic cord.

It was found that abnormal attachments of Scarpa's fascia account for the majority of cases of ectopic testes. —*Richard J. Bennett, M.D.*

Diagnosis and Treatment of Tumors of the Testis. W. F. LEADBETTER. *Am. J. Surg.*, 1958, 95: 341.

TUMORS OF THE TESTIS comprise about 1 per cent of all malignant lesions in the male. Most of them are lethal unless treated and most of the patients afflicted are young. Therapy is not yet standardized. The right testis is affected more often than the left, and the incidence is higher in undescended testes. The cause of the tumor of the testes remains completely unknown. The etiological significance of trauma has not been established.

Primary tumors of the testis are divided into three groups: (1) those arising from the germ cells, (2) those arising from the cells of Leydig (interstitial cell tumors), and (3) those arising from connective tissue cells (Sertoli cell tumors, fibromas, lipomas, hemangiomas). Tumors arising from the germ cells comprise 95 per cent of the total, and these can be divided into two groups: (1) the tumors which exhibit one type of cell both in the primary and the metastatic lesion, for example, the unicellular seminoma; and (2) tumors which simulate, in a distorted fashion, the development of an embryo. The seminoma, by virtue of its unicellular characteristic, has induced numerous theories as to its origin and at present it can only be stated that the explanation of its development is not known. It is apparent that the cells comprising this tumor have characteristics suggesting a direct origin from the germ cell, or closely related to it. One characteristic is their extreme radiosensitivity. There have been numerous classifications; the author uses the one of Friedman and Moore. Any pathological classification is difficult because in any given tumor there may be a great variety of cellular components.

SEMINOMA

Forty to 50 per cent of all tumors of the testis are of this variety. The average age of the patient is 30 years. Cut section reveals a solid white or pinkish tumor. Microscopic examination reveals masses of large oval cells with prominent, deep-staining nuclei. There is a considerable variation in seminomas. They generally metastasize to the retroperitoneal glands

on the side of the tumor with subsequent extension by way of the thoracic duct, lungs, and other organs. Occasionally visceral metastasis may be present without involvement of the lymph nodes. The tumor cells are radiosensitive and 1,500 roentgens are usually sufficient to kill all of them. Surgery after orchiectomy for diagnosis is rarely necessary or desirable.

EMBRYONAL CARCINOMA

These tumors comprise 20 per cent of all testicular tumors. The age of the patients at onset is younger than that for seminoma, the average being approximately 26 years. The tumors are irregular, firm, and tender, and cut sections show irregular masses of firm, pinkish tissue with areas of old or recent hemorrhage. Microscopic study shows a great variation in the cellular content and arrangements. Patterns vary from blastulalike structures to solid masses of deep-staining cells with characteristics of the tissue derived from the trophectoderm. These tumors metastasize both to the retroperitoneal lymph nodes and, when choriocarcinomatous elements are present, by way of the vascular channels. Their radiosensitivity is quite variable. Pure choriocarcinoma of the testis is quite rare, constituting only 1 to 2 per cent of all testicular tumors. Because of the tendency of this tumor toward early invasion of the blood vessels, the outcome is considered completely hopeless and orchiectomy for diagnosis is all that is indicated.

TERATOMA AND TERATOCARCINOMA

These tumors constitute about 30 per cent of all testicular tumors. They are classified together because it is extremely difficult to ascertain that adult teratoma, so-called, does not contain foci of teratocarcinoma. The tumors are usually nodular, firm, and relatively nontender. On cut section they show firm areas interspersed with cysts, cystic areas, or areas of hemorrhage. Microscopic characteristics are the clear differentiation of the tissue into glands, epithelial masses, often with keratinization, and the cartilage or nerve elements set in a loose or dense stroma of obvious mesodermal origin. Areas of seminoma and embryonal carcinoma with cells of chorionic origin may be noted. Metastases may contain any of the component cellular elements. Adult teratoma is a tumor in which complete differentiation of all the embryonal elements has occurred. This is difficult to determine with certainty, and the author indicates that all adult teratomas should be treated as if malignant areas were present.

Teratocarcinomas metastasize initially by way of the lymphatics to the retroperitoneal glands, but blood-borne metastasis may occur, particularly if choriocarcinomatous elements are present.

Metastases from testicular tumors other than choriocarcinoma, generally occur to the retroperitoneal lymph nodes. Those on the right side are most often found in the pericaval glands between the point where the right spermatic vein enters the cava and the renal pedicle. Lesions on the left side metastasize early to the glands at the level of the renal pedicle. When the tumor is large it involves the peritesticular structures and one must look for metastatic disease in the inguinal and deep pelvic lymph nodes. Occasionally primary lymph gland metastasis may be on the opposite side. Supraclavicular and mediastinal glands are frequently involved secondarily. Blood-borne metastasis may arise by way of dissemination of the cells through the thoracic ducts or by way of direct invasion of the blood vessels. The liver and lung are the most frequent sites of metastasis but any organ may be involved.

There are no early symptoms of testicular tumor other than changes of size and consistency of the organ. There may be an ache in the testicle or groin. Symptoms of metastasis depend upon the location. Occasionally there may be enlargement of the breast due to hormonal changes.

To avoid delay in diagnosis any scrotal enlargement must be examined carefully and tumor should be considered in the differential diagnosis. When diagnosis cannot be made by external examination, an inguinal incision should be made, the spermatic cord occluded with a rubber-shod clamp, and the testes examined. If diagnosis cannot be made with certainty at that point it is better to remove the testicle than to incise and examine the lesion. When testicular tumor is found or suspected, the inguinal, iliac, and supraclavicular gland areas should be carefully palpated, retroperitoneal masses searched for, roentgenograms of the chest and intravenous urograms should be taken, and the breasts should be examined for evidence of gynecomastia. A 24 hour urine specimen should be quantitatively tested for urinary follicle-stimulating hormones and chorionic gonadotropic hormones. The changes may be of great aid in determining the effectiveness of therapy.

The plan of treatment for testicular tumors depends on (1) the pathological nature of the individual tumor, (2) the probable presence or absence of metastases to the retroperitoneal lymph glands, and (3) the presence or absence of distant metastases to the supraclavicular or mediastinal glands, the lungs, or the liver.

Prompt orchiectomy to determine the nature of the tumor regardless of the presence or absence of metastases is necessary. In selected cases the author has performed a section of the pelvic lymph glands at the time of orchiectomy. If seminoma is found when microscopic diagnosis has been made, deep roentgen ray therapy to the pelvic lymphatic areas on the side of the tumor and to the retroperitoneal gland areas through anterior and posterior ports for a total of 2,000 roentgens is administered. If metastatic disease to the supraclavicular glands, the mediastinum, or the lungs is demonstrated, these areas are also treated. Occasionally, even though metastatic disease has not been demonstrated above the diaphragm, prophylactic radiation has been given to these areas. By this method with these tumors, it is possible to obtain a 5 year survival of 85 per cent of the patients.

If embryonal carcinoma or teratocarcinoma is found in the absence of demonstrable metastases above the diaphragm and in the retroperitoneal glands, or if retroperitoneal disease is present and judged operable, radical dissection is performed on the side of the primary lesion. The author uses a thoracoabdominal incision, resects the tenth rib, and extends the incision downward across the abdomen toward the pubic

spine. All of the perineal fascia and fat and all the tissues from about the aorta and cava and between the cava and aorta, in accord with the side operated upon, are carefully resected from the crus of the diaphragm to the femoral canal. If "positive" glands are present or if one can palpate enlarged glands on the opposite side, a similar operation is performed after a suitable interval on the side opposite the tumor.

In the group of patients in whom dissection was not performed bilaterally, only one patient has so far developed metastatic disease on the contralateral side in the presence of negative nodes on the side of the tumor. With no "positive" glands no deep therapy has been given. When "positive glands" have been removed deep therapy has been employed after operation in the hope that microscopic disease which remained might be destroyed. Therapy has been used in doses up to 4,000 roentgens. Other patients with inoperable disease have been given deep therapy in the hope that the lesions might respond. Up to this time, with the exception of 2 patients, none have survived.

Seventeen patients with teratocarcinoma and 5 with embryonal carcinoma were operated upon. Three of these, each of whom had "positive" glands on both sides of the abdomen, were subjected to bilateral dissections. Three patients with seminoma were operated upon because pathological diagnosis was not clearly seminoma. Of the 25 patients, 11 had "positive" nodes. Fourteen patients had "negative" retroperitoneal glands. Of the 11 patients with "positive" nodes, 8 are living (3 have embryonal carcinoma, 3 have seminoma, and 2 have teratocarcinoma). One patient without "positive" nodes, but with a primary teratocarcinoma, is dead from extensive metastases to the lungs. One patient with embryonal carcinoma who showed no "positive" nodes on the side operated upon is dead because of the development of contralateral retroperitoneal gland metastases. The other patients with "negative" retroperitoneal glands, demonstrated by unilateral dissection of the retroperitoneal glands on the side of the tumor, are all living and free of disease at the present time. Perhaps the most significant contribution of dissection of the retroperitoneal glands is that it provides positive evidence for or against metastasis to the lymph nodes from the testis, which can be used to guide us in further therapy. —*R. O. Beadles, M.D.*

MISCELLANEOUS

Hinconstarch in Genitourinary Tuberculosis. Anthony Walsh and Michael L. Conalty. *Brit. J. Urol.*, 1958, 30: 25.

Periodate oxidized starch combines with isoniazid and a thiosemicarbazone to form hinconstarch which has high antituberculosis activity and low toxicity. In this study, 17 patients with urinary tract tuberculosis received 2.4 grams daily. The results reported in 11 patients were very good. Many of the patients had previously been on isoniazid, para-aminosalicylic acid, and streptomycin and had done poorly.

In theory, isoniazid and thiosemicarbazone should form a very effective pair of drugs, since thiosemicarbazones are most active against isoniazid-resistant tubercle bacilli. However, few patients can tolerate the latter's toxic effect in the required clinical dosage. Hinconstarch is nontoxic, perhaps because of its slow, continuous liberation of thiosemicarbazone.

—*Bernard H. Hymel, M.D.*

The Treatment of Urinary Tract Calculi. Wyland F. Leadbetter. *California M.*, 1958, 88: 269.

The many theories regarding the formation of urinary calculi do not have direct clinical application. We are left, therefore, with the necessity of dealing with factors that are to some extent under our control: (1) metabolic disturbances, (2) ingestion of calcium and phosphorus, (3) urine volumes, (4) urinary pH, and (5) obstructions and infections.

Little is accomplished by attempts at dissolution or limiting the growth of calculi. Most patients ultimately require surgery because of an acute situation due either to infection or obstruction or both. Complete examination of the patient prior to surgery often results in the diagnosis of unrecognized hyperparathyroidism, hyperuricuria, cystinuria, and obstructive conditions.

All ureteral calculi lodged in the upper third of the ureter and all lower ureteral calculi larger than 0.8 cm. in diameter are removed by surgery. The surgical treatment of renal calculi should have as its purpose:

1. The complete removal of all calculi without permanently damaging the parenchyma, pelvis, or ureter.
2. Correction of any obstructive lesion.
3. The removal, by partial nephrectomy, of any renal unit that is irreparably damaged, not needed, and in which recurrence of stone is likely.

During the postoperative period, a daily fluid intake of more than 3,000 c.c. is desirable. Patients with cystine or uric acid stones should be given enough 50 per cent sodium citrate solution orally to maintain a urinary pH of 7 around the clock. Patients with calcium and triple phosphate stones should be on a low calcium diet. Cranberry juice can be used as a good acidifying agent. Three ounces daily of aluminum jel preparations will partially block dietary phosphorus absorption and 9 gm. of sodium phytate daily will do the same to calcium.

—*Bernard H. Hymel, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Traumatic Periostitis in Infants and Children. MORRIS S. FRIEDMAN. *J. Am. M. Ass.*, 1958, 166: 1840.

INFANTS AND CHILDREN are often seen with radiologic evidence of periostitis when no history of injury or trauma is obtainable. At times, this evidence is discovered during the investigation of other conditions. The roentgenologic findings may be easily mistaken for those of acute osteomyelitis, scurvy, and even malignant bone tumors.

Brief reports of 7 cases illustrating the characteristic clinical and radiologic picture of traumatic periostitis in children are presented. Difficulties in differential diagnosis are illustrated in 3 other case histories.

Since a history of trauma is often missing, forgotten, or denied in periostitis, it becomes important to keep in mind the characteristic picture of traumatic periostitis. —*Donald C. Geist, M.D.*

Eosinophilic Granuloma of Bone (Das eosinophile Granulom des Knochens). HANS HELLNER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 286:564.

THE AUTHOR reports 9 cases of eosinophilic granuloma of bone. In 4 patients the granuloma was found in the skeleton and in 5 in the skull. A detailed history, laboratory data, including roentgenograms, and pathologic reports are given for each patient. A relationship of eosinophilic granuloma to Hand-Schüller-Christian's disease and Letterer-Siwe's disease is discussed. The differences and similarities discussed in the literature on this subject are mentioned.

Two thirds of all patients with eosinophilic granuloma of bone were less than 20 years of age. In no patient was there a generalized affection of the organism. In all patients the temperature was normal, but the sedimentation rate was elevated in a few cases. The granuloma may attain a large size before the first symptoms appear; it may be multifocal or solitary. It may be present in every bone of the skeleton and in the vertebrae may cause Calvé's disease or vertebra plana. Roentgenograms usually reveal an osteolytic round or ovoid lesion frequently located in the proximal or distal ends of the metaphysis. Most of the lesions are confined to spongiosa and as a rule the epiphysial line is not affected. Osteosclerosis around the lesion is rarely observed on the roentgenograms, but almost always can be demonstrated on exploration. In many patients a periosteal reaction is present which makes differentiation from osteomyelitis or even malignant tumors extremely difficult. The lymph nodes or other organs of the body, as a rule, are not involved; however, a transition to lipoid granuloma has been reported. On gross examination the lesion is filled with a gelatinous, friable reddish material. Histologically a reticulum cell matrix is seen with fairly large ovoid nuclei and focal accumulation of eosinophiles. Foam cells, crystals, and small focal hemorrhages are also seen. The following stages have been described: proliferation stage, granulation stage, and involutional stage or stage of final scar.

Two cases are described from the recent literature of patients in whom a diagnosis of Hand-Schüller-Christian and Letterer-Siwe's disease was made. The biopsy, and in one patient an autopsy, showed eosinophilic granulomalike changes in several places. In conclusion the author suggests that a transition from one disease to another may be present and perhaps represents a different response of the reticuloendothelial system to the same noxae. This response also varies with the age of the patient. In eosinophilic granuloma it is mostly self-limited and benign whereas in lipoidosis it is accompanied with a high mortality rate. —*George B. Wichman, M.D.*

Extraosseous Localized Nonneoplastic Bone and Cartilage Formation; So-Called Myositis Ossificans. LAUREN V. ACKERMAN. *J. Bone Surg.*, 1958, 40-A, 279.

MYOSITIS OSSIFICANS is a term given to a group of lesions appearing in the soft tissues that may or may not be associated with the periosteum. The cases of 26 patients with this entity in whom the possibility of neoplasm has been raised have been collected over a long period of time. In the treatment of these patients extensive mutilating surgery was contemplated at one time or another. This group of cases and their differential diagnosis from neoplasm are discussed in the present report.

Classic myositis ossificans usually occurs in young adults, especially males participating in sports, such as football. A localized doughy mass present in the muscle shortly after injury is the common early finding. Bone may be seen in the lesion in 3 to 4 weeks and in one of the reported patients was present 19 days after injury. The muscles involved often take origin from a plane surface contiguous to bone over a wide area. It seems certain therefore that the periosteum participates to some extent in the pathologic process.

Lesions associated with the periosteum, designated as myositis ossificans, may offer difficulty as to the question of neoplasm. Biopsy should be performed in such cases before any radical surgery is undertaken. More important and more difficult are the lesions occurring in atypical locations which appear much like sarcoma.

The author has been impressed by the presence of so-called zone phenomena in the microscopical appearances in the last mentioned group. There is a central undifferentiated zone impossible to distinguish from sarcoma which merges into well-oriented osteoid formation and finally in the periphery of the lesion to well-formed bone (inner, middle, outer zones). All of the cases demonstrating these phenomena have proved to be benign disease. The author believes these findings are most important in differentiating both the typical and atypical case from neoplasm. —*Donald C. Geist, M.D.*

Results of Arthroplasty of the Elbow with Preserved Skin (Resultados de la artroplastia de codo con piel conservada). V. Sanchis Olmos. *Rev. ortop. traumat.*, Madrid, 1958, 2: 1.

In 14 cases of stiff elbow insertion of a skin graft into the joint, a method developed by the author, was performed. Ten of the patients were females and 4 males. Their ages varied from 7 to 54 years. Six of the stiff elbows resulted from an old luxation of the elbow joint, 4 followed tuberculosis of the joint, 1 hypertrophic arthritis, 2 osteomyelitis, and 1 traumatic arthritis.

The skin was procured from the shaved thigh of recently deceased cadavers. The subcutaneous fat was removed from the graft, leaving only the dermis. The skin was preserved for 2 weeks or more in a solution of 1 to 1,000 merthiolate. After 15 days the solution was renewed. The container for the solution was of dark-colored glass, or the vessel was wrapped in black paper.

An incision to expose the joint was made along the lateral aspect of the bend of the elbow and curved above and below to the midline. The extensors of the forearm were detached just above the olecranon to expose the joint posteriorly. The lateral ligaments were carefully preserved. All obstructing and abnormal tissues were removed and the bone ends modeled without removing more bone than necessary. The skin implant, approximately 10 by 15 cm., which before operation had been soaked in a physiologic saline solution containing penicillin, was placed within the joint and attached by nylon sutures to the posterior surface of the anterior portion of the joint capsule, or to the exposed brachial muscle if the capsule had to be removed. Other sutures fixed the skin flap along the sides of the joint cavity.

The extensor tendons were reattached, and the skin implant completely enclosed by suturing of the wound with catgut and, externally, with silk.

The arm was immobilized in plaster with the forearm at 90 degrees flexion and in a position midway between supination and pronation. Physiotherapy was initiated early in the postoperative period.

To procure a stable joint is of first importance. This was accomplished in all but one case. As to function, the author claims excellent results in 64 per cent of these cases, and good results in 21 per cent. In the remainder the results were divided equally between those which were acceptable to the patient but not to the author, and those which were neither acceptable to author or patient.

The author regards the interposition of preserved homogenous skin as the best method of arthroplasty of the elbow joint. —*John W. Brennan, M.D.*

Calcification About the Hand and Wrist. Chestley L. Yelton and Lovick E. Dickey, Jr., *South. M. J.*, 1958, 51: 489.

Calcification about the hand and wrist can be associated with acute pain and, in the opinion of the authors, it is a pathologic entity and syndrome.

The authors presented 109 examples of calcification in the hand and wrist seen in 107 patients, and reported 10 cases in some detail with excellent illustrations of the condition. The sites of calcification in the remaining 97 patients were about the wrist in 66, adjacent to the metacarpophalangeal joint in 17, and in the vicinity of an interphalangeal joint in 15, with deposits in several of these sites in one case.

The authors considered most of these deposits to be secondary to degenerative changes in the ligaments and tendons at the site of wear and tear or at the site of repeated trivial trauma, with local circulatory damage causing the deposit of calcium salts in the regions in question. The mechanism precipitating the acute symptoms remains obscure. The authors stated that tension within the deposit plays a definite role in causing the symptoms.

None of these patients underwent operation for this condition. The usual pathologic findings were hyaline degeneration of connective fibers with amorphous calcareous deposits. Nearly all of the patients were seen because of acute pain, which was often severe and unrelieved by narcotics. Tenderness was well localized and exquisite, and frequently the patients showed overlying erythema and swelling. Low-grade fever, an elevated sedimentation rate, and lymphangitis were sometimes present, and motion of the adjacent joints was always limited and painful.

Diagnosis was established by means of roentgenograms, but often it was necessary to make special soft-tissue views to be sure of the deposits. The prognosis was good, and spontaneous recovery sometimes occurred within a week or 10 days. Immobilization was certainly a benefit, but x-ray therapy, although advocated by many, was used in only one of the authors' cases and without spectacular results. In their experience, injections of a solution of procaine into the deposits gave almost immediate relief in many cases, and rarely did they find it necessary to give more than one injection. They also found that the addition of a few drops of compound F to the procaine solution gave highly satisfactory results. In short, they felt that this simple form of treatment, namely, infiltration with procaine, was most rewarding in that it gave immediate relief which usually was permanent.

—*Einer W. Johnson, Jr., M.D.*

Kienböck's Disease in Manual Workers (Choroba kienbocka u fizycznie pracujacych). Willibald Rzicha. *Polski przegl. chir.*, 1957, 29: 1113.

Aseptic necrosis of the semilunar bone (Kienböck's disease) attacks only mature bones whose development has already been accomplished. The pathogenesis of this disease is not simple and as a result many theories have been advanced. The most probable one is that which attributes the etiology of the disease to the small rhythmic traumas repeated during a long period of time which are usually connected with occupation. Miners are particularly exposed to this kind of trauma in the operation of compressed air drills. (There were 25 miners among the author's 35 patients.)

The traumatic etiology is more probable but fracture of the semilunar bone is without any doubt one certain cause of the aseptic necrosis. The predisposition of the semilunar bone to the necrosis can be explained by the anatomical situation of this bone (exposed to traumas) and its poor vascularization.

According to the author's observations aseptic necrosis of the semilunar bone is usually seen in the third or fourth decades of life, occurring more often in the right wrist than in the left and more often among men than women.

Person and Wiles distinguish four stages of aseptic necrosis of the semilunar bone:

1. The initial, acute stage, lasting from a few weeks to several months, in which patients complain of increasing pain when performing manual labor.

2. The symptomless stage when patients have no complaints. This period lasts from several months to several years.

3. The active stage which lasts several years. In this stage the pain increases and finally becomes constant and independent of the use of the hands for work. The movements in the wrist are limited and pressure on the semilunar bone is painful.

4. The final stage, characterized by deformity and disability. The pain diminishes but complete stiffness of the wrist appears. The above stages are not clearly delimited and the passage from one stage to another is inconspicuous. The disease can also be clinically symptomless and be discovered only by an incidental roentgen examination. Sometimes necrosis appears in both wrists.

During an exacerbation, according to Rajchman, a slightly elevated body temperature, leucocytosis, and increased sedimentation are found.

The final diagnosis of an aseptic necrosis of the semilunar bone can be made by roentgen examination only. In the initial stage of the disease the bone structure appears more dense in the roentgenogram. Later foci of rarefaction develop. The shape of the bone changes and finally the structure of the bone undergoes fragmentation.

The treatment of Kienböck's disease is not too successful at the present time. The routine treatment is immobilization of the forearm by a plaster cast or by a splint. Most of the authors agree that the immobilization should be long, i.e. from several to 20 months, and should be applied in the initial phase of the disease. The prognosis is better in young individuals because of the greater capacity of regeneration of the bone.

Since the results of conservative treatment are unsatisfactory, some workers propose surgery. The removal of the diseased semilunar bone has been abandoned because of the mutilating results. The other operative treatments are: removal of the spongy tissue of the semilunar bone, drilling of the bone to increase the blood supply, and sympathectomy and blockade of the stellate ganglion. The aforementioned operations have been performed on too few cases to be evaluated properly.

Aseptic necrosis of the semilunar bone is usually seen in hard working people, particularly in those who use pneumatic tools; therefore, this clinical entity should be considered as an occupational disease. Every case should be thoroughly analyzed and special attention given to the time and kind of work being performed.

In conclusion the author analyzes 35 personally observed cases of Kienböck's disease.

—*M. Srokowski, M.D.*

Metastatic Tumors of the Hand. ROBERT KERIN. *J. Bone Surg.*, 1958, 40-A, 263.

THE LITERATURE on tumor metastases to the hand, a rare occurrence, is reviewed and 7 cases added by the author. Only cases demonstrating secondary involvement by metastasis and not by extension are included in the study. A kidney neoplasm with metastasis to the soft tissue of the hand was reported in 1907, the first record of metastasis to this area. Another early case was that of a chorioepithelioma of the right testicle with subungual metastases to the right finger. In 1906 the earliest mention of a metastasis directly to the osseous tissue of the hand appeared in the British literature. The patient was an elderly woman with carcinoma of the breast.

Of the 23 cases cited, lung tumors were the primary source in 11 cases. Breast tumors were the primary source in 2. In 2 other cases, the kidney was the primary source. Other primary sources mentioned were the bladder, uterus, lymphosarcoma, parotid gland, colon, and prostate. It is felt that the hand is generally not included in roentgenographic examination of the skeleton and this fact may account for the small number of metastatic lesions to the hand recorded in the literature. The bronchogenic carcinoma, the most frequent metastatic tumor found in the hand, characteristically appeared inflamed and often painful, swollen, warm, and discolored. It was often mistaken for a felon or underlying osteomyelitis.

In differential diagnosis one must consider tuberculous dactylitis, enchondroma, epidermoid cysts, osteoid osteoma, giant cell tumor, and bone cyst.

—*John Robert Close, M.D.*

Osteoarthritis of the Hip. K. LITTLE, LIONEL H. PIMM, and J. TRUETA. *J. Bone Surg.*, 1958, 40-B: 123.

THE ELECTRON MICROSCOPE and x-ray diffraction have been used to make a study of both normal and osteoarthritic hyaline cartilage. The normal hyaline cartilage appears to consist of collagen fibrils closely surrounded by a gelatinous or spongy matrix. The hyaline cartilage from the arthritic joint shows two main differences: (1) The collagen has a definite orientation and (2) there is less ground substance.

Studies in the fetus and newborn show that with diffraction the whole of the cartilage is unorientated except for the immediate surface layer. Both living and dead cartilage cells have been encountered in both normal and arthritic cartilage.

—*Richard J. Bennett, Jr., M.D.*

Slipped Upper Femoral Epiphysis; Characteristics of 100 Cases. H. JACKSON BURROWS. *J. Bone Surg.*, 1957, 39-B: 641.

THE FOLLOWING OBSERVATIONS are based on questionnaires sent to 100 patients with a slipped upper femoral epiphysis. The patients comprised 60 boys and 40 girls. The boys were between 14 and 16 years of age and the girls between 11 and 14. The left hip was affected more than twice as often in the boys; 11 boys and 12 girls had both hips involved.

The diet (ascorbic acid excretion tests were carried out in many patients) appeared to have no influence on the condition. Most of the children appeared to be unusually tall, and some were abnormally tall.

The "index of build" (I B) showed no definitely direct relationship to this condition. Sexual development was normal in 75 of the patients. A delay or arrest of sexual development was found in possibly 15 patients. Statistics showed that girls who menstruate are almost immune to slipping of the upper femoral epiphysis. Some patients were found to be of the "Frölich" type, and one patient was labeled as of the "Lorain" type. The urinary ketosteroid excretion was measured in 13 boys and 12 girls, but the findings were inconclusive because there is a wide spread of "normal" urinary ketosteroid excretion during the adolescent period.

Only one patient showed evidence of retardation of the ossific centers, 2 patients showed osteoporosis, and one patient showed greater bone density than average. No constant relationship between epiphysial changes and slipped upper femoral epiphysis was found.

In about one-half of the cases a relevant injury occurred prior to the onset of the condition. In about one-half of the cases, pain and limp started simultaneously with the onset of the disease. The pain was usually related to the hip joint and not to the knee joint. More than one-half of the patients showed shortening of 0.5 inch or more in the affected extremity. Muscular atrophy was present in about one-half of the cases. About one-half the cases also showed external rotation and adduction deformity of the affected extremity. Limitation of motion, classified from slight to moderate, was found in about one-half of the cases. The epiphysial plate of the upper femoral epiphysis appeared to be thickened in more than one-half the cases. The contralateral side in unilateral cases revealed no appreciable changes in most of the cases.

The sedimentation rate, the Wassermann test, the blood calcium and phosphorus, and the alkaline phosphates were normal in most cases. In most of the cases, there was a delay in treatment. The delay was caused by parental procrastination, by diagnostic failure, administrative errors, and shortage of hospital beds.

The author then presented 6 cases of particular interest: one of slipped upper femoral epiphysis in a pituitary giantess, one in pituitary hypogonadism in a patient of 33 years of age, one in a patient in whom the opposite limb was affected by infantile paralysis, one in a patient with Legg-Perthes' disease in the opposite hip, and 2 cases which occurred in brothers.

—*George I. Reiss Jr., M.D.*

Congenital Vertical Talus. G. C. Lloyd-Roberts and A. J. Spence. *J. Bone Surg.*, 1958, 40-B: 33.

This interesting article on congenital, severe, rigid flat foot with talonavicular subluxation emanated from the Orthopedic Department, Hospital for Sick Children, London. It is concerned with the diagnosis and differential diagnosis of congenital vertical talus.

Thirty-two feet in 22 patients comprise the number of cases.

Clinically, the lesion is present at birth. The foot is severely flat, the sole is prominent, and the forefoot is dorsiflexed; deep creases may be noted in front of the ankle, and eversion of the heel and abduction of the forefoot become progressively more dominant as the child ages. Roentgenologically, one sees a severely vertical talus, which is in line with the tibial shaft. The talus may show a typical hourglass deformity. The navicular bone may be in a state of subluxation with simulation of Koehler's disease.

The associated congenital defects encountered by the author were as follows: (1) arthrogryposis observed in 10 patients (16 feet); (2) no associated abnormalities in 9 patients (13 feet); (3) spina bifida in 2 patients; and (4) one case of neurofibromatosis.

In the differential diagnosis one should rule out paralytic flatfoot, idiopathic flatfoot, flatfoot in cerebral palsy, spurious correction of clubfoot, and talipes calcaneovalgus.

Recommended treatment is ill defined. Since most of the reported series are small, no definitive therapy is suggested.

—*Samuel L. Governale, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Surgical Treatment of Juvenile Bone Cyst by Packing with Spongy Bone (Die chirurgische Behandlung der jugendlichen Knochencysten mit der Spongiosaplombe). H. Hellner. *Chirurg*, 1958, 29: 97.

The author discusses the various types of bone cysts, i.e., neoplastic, inflammatory, or degenerative in origin, and discusses the true cyst which is lined with endothelium or epithelium, versus the pseudocyst in which such linings cannot be found. He points out that one can not distinguish on the roentgenogram whether an area of radiolucency in bone is filled with fluid or tissue. He believes that about half the bone cyst shown in the roentgenogram will be filled with fluid and half with soft tissue, and does not think it important to say whether it is a true cyst or a pseudocyst. The author is particularly concerned with juvenile bone cyst which, he states, is the most important and most frequent neoplastic bone cyst found in children and young adults. These cysts are smooth walled and contain a liquid which is either light yellow or bloody in color. They are usually found in the metaphysis, occasionally in the diaphysis, and never in the epiphysis. They arise because poor embryonal connective tissue, which is weak in osteoblastic activity, has been deposited, usually in the metaphysis of the bone involved. As time goes on, this fibrous connective tissue becomes liquefied and the pressure built up with liquefaction further increases the size of the tumor. Secondary hemorrhage may take place because the capillaries are unduly fragile. After spontaneous or other fracture, these cysts do not heal because of the poor osteoblastic capability of the tissue involved. Giant cells are often found in the periphery of the cyst but these cysts are not identical with giant cell tumors. The author does not believe that trauma has anything to do with the origin of these cysts but simply that trauma draws attention to the area perhaps after an x-ray has been taken.

The author has treated these cysts by making a small incision into the cyst, withdrawing the fluid, and then most carefully curetting the wall of the cyst in order to remove the aforementioned nest of giant cells which may be found in little cul-de-sacs extending into the

surrounding cortical bone. He then secures spongy bone from the ilium. Since these cysts usually occur in young people, he elevates the cartilaginous crest of the ilium, takes out whatever amount of spongy bone he will need, and then sutures the crest back into position so as not to interfere with growth. The spongy bone is then compressed into small pellets, and these pellets are pounded into the cavity of the cyst quite firmly, much as the dentist compacts amalgam into tooth cavities. He has had uniform success with these techniques and in only one case was it necessary for him to use other measures, such as an intramedullary Rush pin. He states that conservative treatment is not successful in these cases, and further that the use of cortical bone does not give successful results. Bone, either cortical or spongy, that is taken from the bone bank is even worse. In none of his cases was it necessary to resort to such drastic measures as resection. He thinks that the true giant cell tumor of bone is related to the juvenile bone cyst and believes that his technique can be applied to the true giant cell tumor.

—Robert C. Combs, M.D.

Instruments for Use with Flexible Steel Wire in Bone Surgery. F. W. RHINELANDER. *J. Bone Surg.*, 1958, 40-A, 365.

THE USE of wire loops allows the surgeon to secure open reductions with limited exposure and actually pull bone ends together whereas other forms of internal fixation might hold them apart. The difficulty with stainless steel wire loops has been excessive strain on the basic twist applied at the time of tightening. An instrument was developed by the author 15 years ago which allowed the separation of the maneuvers of tightening and twisting and embodied the principle of a coil spring to vary and to measure tension. The present model has been used for 10 years by competent surgeons who have proved its value in protecting wire loops from breaking due to uncontrolled strain. It is possible to ascertain the degree of tension accurately by observing the notches on a scale. The postoperative complication of fracturing of the wire heretofore sometimes encountered is rendered far less likely by the use of this instrument.

A C clamp designed to maintain fracture fragments in accurate position about major joints while internal fixation is carried out with the author's wire-washer set and wire tightener is described. This apparatus is particularly valuable in the treatment of posterior fractures of the ankle. As the jaws of the clamp are drawn down in parallel planes, they always bear the same relationship to each other except for the distance changed.

In addition to these two instruments, a wire-washer is used that provides strong longitudinal fixation via a single drill hole. *—John Robert Close, M.D.*

Reconstruction of the Amputated Thumb. I. K. MIKHAIL. *Arch. Surg.*, 1958, 76: 372.

AMPUTATION OF THE THUMB is not a common injury. Over a period of 5 years, from January 1, 1952, to December 31, 1956, 15 cases of thumb amputation in the Arabian American Oil Company hospitals have been observed. These cases occurred among 581 hospital admissions for injuries to the hand, not including the many more cases treated in the outpatient department. The thumb injuries, in general, numbered 61 cases, or 10 per cent of the total injuries for which the patients were admitted. Of the 15 cases of amputated thumb, only 3 were serious enough to require reconstructive surgery.

The importance of the thumb for the pincer action cannot be overestimated. The loss of a thumb is a great disability to any member of the community. The magnitude of the disability led many hand surgeons to devise a multitude of reconstructive procedures, from the simplest to the most intricate, such as the transplantation of a toe to the hand for replacing an amputated thumb.

The author discusses various sites of amputations and possible corrective reconstruction. The operative procedures are discussed in detail. Preference is indicated for a segment from the seventh rib, excised where it has its maximum curve, which is near the midaxillary line.

The periosteum over the part to be buried is excised. If there is cartilage over a metacarpal, this is removed. The rib should fit snugly into the receiving bone. This will reduce the necessity of rigid immobilization, and the patient can exercise the thenar muscles from the start.

The rib is fixed in such a way that its gentle concavity will face the rest of the fingers when in opposition. The tubular graft is sutured over the rib. Hemostasis is important. Frequent inspection to spot infection or hematomas for prompt drainage is justifiable.

External splinting with splints or plaster is desirable for 2 to 4 months. The average length of time for these 5 procedures is about 10 weeks. The patient does not have to be hospitalized through all this period. *—C. Fred Goeringer, M.D.*

Infections of the Vertebral Interspaces After Operations on Intervertebral Discs. C. ROGER SULLIVAN, WILLIAM H. BICKEL, and HENDRIK J. SVIEN. *J. Am. M. Ass.*, 1958, 166: 1973.

INFECTION OF THE INTERVERTEBRAL SPACE after surgical removal of the nucleus pulposus occurs infrequently. The diagnosis is often difficult because of atypical physical findings and because fever is not prominent. Excruciating "spasms of pain" in the lumbar region associated with severe spasm of the paravertebral musculature and initiated by motion of the back or lower extremities are characteristic of infection of the intervertebral space. The erythrocytic sedimentation rate is nearly always increased, whereas leucocytosis is rare.

The most significant roentgenographic sign is erosion of the epiphysial plates adjacent to the involved interspace. This may not appear until 5 or 6 weeks after operation. Early aspiration of the interspace may permit identification of the organisms responsible for the infection. Appropriate antibiotics should be administered. However, the most important treatment is adequate immobilization of the spinal column by means of a plaster-of-paris cast or rigid brace. The almost inevitable result of infection of the intervertebral space is sound intercorporeal fusion, provided immobilization is prolonged.

The Direct Approach to Congenital Dislocation of the Hip. E. W. SOMERVILLE and J. C. SCOTT. *J. Bone Surg.*, 1957, 39-B: 623.

THIS ARTICLE is based on a study of 50 dislocated hips in 44 patients treated consecutively. There were 42 girls and 2 boys.

The treatment was divided into four stages: (1) reduction, (2) establishment, (3) correction of anteversion by means of a rotation osteotomy of the femur, and (4) mobilization.

The femoral head is to be reduced into the acetabulum with the least possible trauma. This is achieved by the use of a double abduction frame which permits gradual reduction with progressive stretching of the soft tissue, a process that is usually completed in 4 weeks.

After the reduction of the femoral head into the acetabulum it is necessary to obtain full medial rotation of the hip, but if the limbus of the acetabulum is inverted sufficiently to cause an obstruction it must first be excised. If the limbus is not inverted sufficiently to cause a true obstruction, all that is necessary is to place the hip in full medial rotation.

If the limbus has been excised the leg is immobilized in a hip spica in full medial rotation and extension, and about 40 degrees of abduction. This spica is left on for one month. The spica is removed and an adequate lateral rotation osteotomy is performed just below the lesser trochanter. The fragments are fixed with a plate and four screws. Experience has shown that the degree of rotation required is from 60 to 90 degrees, depending on the anteversion and the amount of medial rotation obtained at the previous stage of the treatment. If the neck of the femur is in a valgus position, it is advisable to angle the osteotomy into the varus position. The fragments unite in 6 weeks.

Up to this point treatment has taken about 14 weeks, and all that remains is to allow the hip to become mobile and the child to begin walking.

The first obstacle to reduction is the shortened muscles. These can be stretched by manipulative maneuvers in which the head of the femur is reduced into the acetabulum with the hips flexed, the legs being abducted and extended.

Arthrography is carried out under general anesthesia, and the skin receives the usual preoperative preparation. A 17 per cent solution of diodone is injected into the hip joint by the anterior route until the joint is full, but not tense.

There are two principal features to be looked for: the position and shape of the limbus and pooling of the contrast medium in the floor of the acetabulum.

The authors made an interesting observation concerning the development of the femoral head. The normal femoral head is formed from two ossific nuclei which, when they develop simultaneously, are not usually seen as separate entities; however, in congenital dislocation the development of the medial center is delayed, or perhaps suppressed altogether, unless a stable reduction is obtained early. With recovery of function, and when the mechanics are normal, the ossific nucleus grows rapidly. Usually the outline becomes a little shaggy and irregular. This appearance is due to rapid growth, which suggests that there is no vascular insufficiency. A second nucleus often develops in the medial part of the head, giving the whole ossific nucleus a somewhat elongated appearance. The two nuclei soon fuse and the whole progressively increases in size. In some hips the primary center, placed laterally in the head, grows more rapidly than the medial center, which produces a progressively increasing valgus.

The subsequent development of the hips generally, and its individual components, are described.

The status of 50 completely dislocated hips treated consecutively is described at the end of a follow-up period of from 3 to 7.5 years.

—*C. Fred Goeringer, M.D.*

Late Results of Transplantation of the Tibial Tubercle in Recurrent Dislocation of the Patella. TORSTEN JERRE and BERTIL KNUTSSON. *Acta orthop. scand.*, 1957, 27: 141.

DISLOCATION OF THE PATELLA is of rare occurrence. Many methods of repair have been devised and reported. This article presents the late end results of recurrent dislocation of the patella treated by transplantation of the tibial tubercle.

An incision was made into the lateral wall of the knee joint extending a little beyond the tibial tubercle. The patellar ligament was dissected free and the tibial tubercle was chiselled off. A thin bone flap was chiselled up about 1 cm. medially and distally to the tibial tubercle and the tibial tuberosity was fastened beneath it. The extremity was immobilized in plaster of paris for 3 to 6 weeks, following which active and passive movements were started.

During the period from 1936 to 1955, 28 patients (32 knee joints) were operated upon by this method. The patients were followed up for an average of 10.4 years. Eighteen patients had no symptoms at all, 9 had fatigue and aching after strenuous exercise, 4 had recurrent dislocations or subluxations, and 8 had tenderness over the tibial tubercle. About one-third of the patients had some slight loss of flexion, and deforming arthritis was found on x-ray examination in most of them, although it produced no symptoms. A maldeveloped lateral femoral condyle was found in 18 patients.

The late results were, therefore, good, with only 6.5 per cent recurrence of the dislocation or subluxation and little other untoward symptoms or signs.

—*Donald C. Geist, M.D.*

FRACTURES AND DISLOCATIONS

Changes in the Serum Proteins of Patients with Fractures (Bluteiweissveraenderungen bei Frakturen). H. W. SCHMITT. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 286: 554.

IN ORDER TO demonstrate changes in the serum proteins of patients with acute fractures the author has examined 30 male and female patients. The following tests were performed: quantitative albumin determination, electrophoretic determinations of single fractions, sedimentation rate, Takata flocculation reaction, and Weltmann's test or precipitation of proteins with calcium chlorate. The examination was performed from the first day of the accident to the sixth day, the third week, and the sixth week. The

total protein in all patients was normal. Electrophoresis revealed a slight decrease in albumin fractions on the sixth day and an increase of the alpha-1 and alpha-2 globulin fractions. Beta fractions of globulin were normal or slightly decreased. Gamma fractions were normal. In 3 weeks the results did not change. In 6 weeks the values of single fractions returned to normal. The sedimentation rate as measured by the Westergreen method was increased in the beginning from 20 to 40 hr. and at the end of 6 weeks returned to normal. Weltmann's reaction followed a similar pattern. The Takata reaction did not change and was negative at all times. In those patients whose roentgenograms revealed a delayed formation of callus, a persistence of elevation of single globulin fractions was noted which appeared to be related to the length of healing.

The author suggests that the aforementioned changes are nonspecific in nature and represent a generalized reaction of the body to trauma. This reaction can be compared with an acute inflammation in the beginning stage and chronic inflammation at the later stage until the fracture heals. The author also suggests that perhaps in the future the electrophoretic fragmentation of proteins may be used to determine the prognosis of fracture healing. Since the albumin is decreased in patients with fractured bones and albumin is needed for the foundation of callus, the therapeutic administration of proteins orally or in the form of blood, should theoretically favorably influence the healing of fractures.

Several diagrams demonstrating the electrophoretic changes in serum proteins are included in the article.

—George B. Wichman, M.D.

Twenty Year Mortality Statistics on Fractured Hips (1936-1956). ROBERT WEDEEN, HERBERT ROSENTHAL, and PAUL MILLER. *Bull. Hosp. Joint Dis.*, N. Y., 1957, 18: 86.

IN THE LAST 15 years the mortality in cases of fractured hip has averaged about 25 per cent with conservative therapy and 10 per cent with operative procedures. Of 938 patients treated by various methods in the Hospital for Joint Diseases from 1936 to 1955 10.5 per cent died. During the past 5 years 3 more cases in a hundred have survived than in the same period 15 years ago. The mortality is highest for the intertrochanteric fractures with the peak in the 85 to 89 year age group. Spica mortality was 6 per cent, less than that of traction. Common causes of the 98 deaths were: embolism (30 per cent), cardiac causes (25 per cent), pneumonia (20 per cent), and cerebral vascular accidents, uremia, and septicemia (25 per cent). There were no deaths from anesthesia or septicemia in the last 10 years of the study. In the higher age groups the mortality was less with surgical procedures.

—Ernest H. Bettmann, M.D.

Open Tibial Shaft Fractures—Immediate Soft Tissue Closure. W. ADRIAN FREEMAN and ARTHUR L. GARNES. *Am. J. Surg.*, 1958, 95: 415.

THE AUTHORS reviewed the case records of 147 patients who were admitted to the Harlem Hospital with open tibial shaft fractures, either unilateral or bilateral.

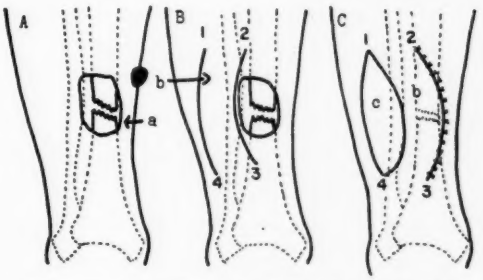


FIG. 1 (Freeman, Garnes). *A*, Showing defect (*a*) resulting from loss of soft tissue. *B*, Showing the formation of a bipedicled (skin and subcutaneous tissue) contiguous flap (*b*) between points *1*, *2*, *3*, *4*, elevated from the underlying tissue. *C*, Showing the flap (*b*) transferred over the defect. The area (*c*) represents the defect left after transfer of the flap. This area is covered by a free partial-thickness skin graft.

The basic principle and objective of the management of an open fracture is its conversion into a closed fracture. The injured person and the open wound should receive sound surgical attention from the time of injury until the closure of the wound.

The treatment of single tibial shaft open fractures and bilateral tibial shaft open fractures is discussed with emphasis on treatment during the ambulance phase, the emergency ward phase, the operating room phase. The objectives of reconstructive surgery are: (a) the repair of vital structures, blood vessels, nerves, and tendons; (b) the reduction and immobilization of the fracture in the simplest possible manner; and (c) the closure of the skin without tension.

The dynamic or unstable fracture must be reduced and retained. Use is made of the broad-spectrum antibiotics, tetracycline or oxytetracycline, 250 mgm. 4 times daily for 72 hours. The continuance of antibiotic therapy is governed by the temperature chart. Penicillin is administered only in the emergency ward, 600,000 units on admission.

The simplest method possible for retention or fixation is recommended. The device used for this purpose should be introduced as far as possible from the open wound. The following methods were employed: (a) traction through the os calcis; (b) intramedullary nailing; (c) the two-pin method incorporated in plaster; and (d) plaster body cast.

Tension is one of the greatest hazards to effective wound closure. The length of the laceration or diameter of the wound seems to have little relation to healing if tension and infection are avoided. To eliminate tension, some type of skin graft may be indicated.

Wherever possible, local flaps are utilized. The reasons for this choice are the following:

1. No immobilization of the uninvolved parts of the body is required.

2. In multiple injuries, fixation of other parts to the fractured limb may be impossible or disadvantageous.

3. In elderly patients, due to changes in the joints, it may be difficult or impossible to approximate the other leg or an upper extremity to the injured tibia.

4. In employing flaps from a distance, the position for the proper application of the flap may not be the best position for proper bone alignment.

—*C. Fred Goeringer, M.D.*

ORTHOPEDICS IN GENERAL

An Experimental Study Concerning Accelerated Consolidation of Fractures. Leo Jarry and Hans K. Uhthoff. *Rev. canad. biol.*, 1958, 17: 62.

The authors describe a new procedure applicable in open reduction for the treatment of transverse fracture of the diaphysis of the long bones by using a new so-called "petal" technique.

By increasing the contact area of the fragments, especially with the surrounding soft tissue, by promoting the anchoring processes near the fracture site and by biological changes of the compact bone, an acceleration of the fracture consolidation is achieved. Roentgenological examination proved that the decalcification and revitalization of the cortex is always more pronounced on the petal side compared to the opposite control side. Histological findings indicated that the formation of the anchoring callus takes place much closer to the fracture site if the petal method is applied.

The technique involved three main principles: (1) to increase the surface area of the fracture and to increase the contact area of the fragments with the surrounding soft tissue, (2) to influence favorably the anchorage process of the callus, and (3) to speed up decalcification and revitalization of the cortex at the fracture site by reducing its thickness (thinning). It is necessary that the petals be cut very thinly in order to prevent their breaking off at the base. By the cutting of these petals, the thickness of the cortex is reduced (thinning). This study was carried out on 428 white rats, male and female, weighing from 260 to 400 gm., which were all subjected to the same carefully controlled diet. The operations were performed on the right as well as the left tibia.

The investigation included three different methods concerning the site of the petals: (1) in the first group of 34 rats, the petals covered an area extending over 1 cm. of each fragment, and the bone was fractured by the use of an oscillating saw, (2) in a second group of 116 rats, the petals were produced in the same manner, but the tibia was cut with a scalpel, and (3) in the third group of 278 rats, the petals covered only 0.25 cm. of each fragment, and the bone was cut with a scalpel.

In order to carry out the stability test, the bone was placed across two metal bars supported by wooden blocks. A fine metal wire was looped over the fracture site of the bone. To the two free ends of this wire a receptacle was attached. This receptacle served to receive the weights applied to the bone. The breaking point was established in grams.

In none of the cases did the petal side alone exhibit a bending defect. —*C. Fred Goeringer, M.D.*

Deficiencies of Stainless Steel Internal Fixation Units. George J. Curry and Donald K. Pine. *Am. J. Surg.*, 1958, 95: 518.

The authors have analyzed 384 cases in which metal was used for internal fixation of fractures with regard to complications arising from the use of metal. They found an incidence of 10 per cent of either broken metal or rarifying osteitis of the surrounding bone. Eighty per cent of these fractures showed either nonunion or delayed union.

Stainless steel is not an inert metal. In industry stainless steel will corrode in certain instances. In paper-making, light stainless steel parts will corrode when exposed to sodium bisulfite. In the air force stainless steel exhausts disintegrate on long range flights. Watch cases of stainless steel crack from perspiration. The authors state: "Because of rapid corrosion in sea water, some metallurgists now advise against the use of stainless steel in weak chloride solutions, which would include tissue fluids."

The surface of perfect stainless steel parts is protected by a microscopic coating produced by electropolishing and immersion in a nitric acid. Type 316 and 317 stainless steel (SMo) contain chromium and molybdenum which inhibit corrosion while nickel stabilizes the crystal structure as austenite. The microscopic coating is chromium oxide which is corrosion resistant. The slightest defect in this coating will lead to dissolution of the metal or corrosion. Electrolysis is the cause of the corrosion. It is the formation of a battery with two points of different potential in an electrolytic solution. This may come about with stainless steel implants when two different metals are used or when metal is deformed by pressure. The authors found 20 millivolts between two screws of the same composition which, while small, will cause electrolysis.

Corrosion will cause local staining of the tissues and a fibrous tissue reaction to wall off the offending reaction. In superficial places secondary infection may arise when the skin breaks down. Bone will be decalcified by electrolysis and this will lead to fibrous tissue replacement and loosening of the metal implant. Corrosion will weaken metal; the main site is at the junction of the plate and screw where abrasion occurs.

Stainless steel is much less strong than the bone it replaces. Vitallium more nearly approaches the strength of bone than does stainless steel.

Of 384 patients with adequate follow-up, 39 were found to have broken metal implants.

—*Richard G. Saxon, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Nonhemorrhage Cleavage of the Aorta. SHELDON OSCAR BURMAN and J. H. DIETER GERATZ. *Ann. Surg.*, 1958, 147: 571.

IN DISSECTING aneurysm of the aorta there is a column of blood within the tunica media which was preceded by degeneration of this layer. This degeneration allowed a plane of cleavage to form in the vessel wall, with hemorrhage into this space. The bleeding results from the torn vasa vasorum; in addition, an intimal tear may allow blood from the true lumen to escape into the medial cleft, although this is not a necessary factor in the production of a dissecting aneurysm. The theory that cleavage precedes the hemorrhage is supported by two observations: (1) the wall of the artery may be wholly separated beyond the farthest extent of the medial column of blood, and (2) more remarkably, the vessel wall may be completely cleft without the presence of significant quantities of blood between the layers. This cleavage without hemorrhage may constitute a fatal disease in itself, and the authors present 3 case histories of their own and others from the literature to prove it.

In all of the cases reported, the autopsies revealed severe noninflammatory degeneration of the walls of the affected arteries, which led to spontaneous cleavage. In one case the separation caused a clinical state resembling acute arterial occlusion in the vessels of the left lower extremity due to separation of the common iliac artery, and in one reported history the pulse of the right upper extremity was absent because of cleavage of the innominate artery. Thus the separation can extend from the aorta into any of its branches.

The fundamental disease is degeneration of the media which leads to dissociation of the vessel coats and hemorrhage from the vasa vasorum. When the layers of the diseased arterial wall become dissociated, the plane of cleavage is always in the outer media where the muscle and elastic tissues appear to be better preserved. Investigation has shown an increase in chromatotropic basophilic mucoid substance in the cystlike spaces of media of the diseased arteries, which represents in abnormal amounts and situations collections of acid polysaccharides, predominantly chondroitin sulfates B and C. This appears to be a reaction evoked by anoxia or ischemia of the affected tissue. Aortic cleavage is necessarily preceded by medial degeneration, characterized by loss of muscle and elastic elements and the accumulation of abnormal amounts of ground substance. —*Albert M. Schwartz, M.D.*

Disorders of the Abdominal Aorta; Clinical Observations on Survey of 207 Cases. DAVID W. KRAMER, PAUL K. PERILSTEIN, and ALGY DE MEDEIROS. *J. Am. M. Ass.*, 1958, 166: 1711.

THE AUTHORS confine their presentation to the clinical aspects of pathologic changes which may take place in the walls of the abdominal aorta with emphasis on the atheromatous type. A survey of 3,000 consecutive cases of vascular disorders was made in which 207 patients were found to have evidence of pathologic changes in the abdominal aorta. Group 1 consisted of 100 patients who had definite evidence of occlusive vascular disease. It was divided into three subgroups: those with positive roentgenographic findings, those whose roentgenograms were negative for calcification, and patients for whom no roentgenograms were available. The second group consisted of 107 patients with roentgenographic evidence of calcification and no evidence of impaired circulation. The author discusses the etiology and pathology of these changes with reference to intravascular agglutination, the site of thrombosis, and the modus operandi of the thrombosis.

In one of the groups there were 36 patients with complete occlusion of the abdominal aorta. In this group 80 per cent complained of claudication with marked predominance at the calf level, 64 per cent of pain, and 50 per cent of numbness, paresthesia, and fatigue. Pallor was noted as was atrophy of the muscles in the thigh. Pedal pulses are usually absent. Femoral pulses were diminished or absent. In the study of the roentgenograms of the 36 cases of marked occlusion of the abdominal aorta it is apparent that arterial thrombosis may be present and not be detectable by roentgenogram unless calcific deposits have been superimposed on the pathologic process. Conversely the relationship of the degree of aortic calcification to the presence of occlusive phenomena was tabulated. Of 58 patients with marked roentgenographic findings 37 per cent had evidence of occlusion and 36 per cent had none. Although calcification in itself does not necessarily mean occlusion, the greater the degree of calcific deposit the greater the chance of thrombosis. The authors concede that thrombosis of the abdominal aorta may occur one decade earlier than expected in individuals with thrombosis of generalized arteriosclerosis. In the first group of 100 cases the ratio of males to females was 2 to 1 whereas in the group of 36 patients with advanced pathology the ratio was 4 to 1. No Negro patients were reported in their series. Aortograms are recommended only in selected cases. Diagnosis is made on the basis of the symptoms and signs suggesting markedly impaired circulation but with a striking preservation of nutrition in the distal parts. Circulatory function tests will confirm interference of the blood supply to an extremity, however, a proper interpretation of skin surface temperature studies must be kept in mind. A routine soft tissue roentgenogram of the abdominal aorta is recommended. —*Allan D. Callow, M.D.*

The Early Diagnosis of Ruptured Abdominal Aneurysm. RICHARD T. BEEBE, SAMUEL R. POWERS, JR., and EDWARD GINOUVES. *Ann. Int. M.*, 1958, 48: 834.

SUDDEN RUPTURE of a saccular aneurysm of the abdominal aorta is no longer a necessarily fatal condition. Accurate, early diagnosis can markedly reduce both the immediate mortality and the late deaths,

which are principally due to distal tubular necrosis. This report deals with three diagnostic aids which have not been sufficiently stressed but are frequently helpful in arriving at an early diagnosis. These aids consist of ecchymosis in the lower abdomen or perineum, loss of deep tendon reflexes in the lower extremities, and loss of the psoas shadows in abdominal roentgenograms. These diagnostic clues are found in the period immediately following rupture, when the blood loss is still confined to the retroperitoneal space and before peripheral collapse and peritonitis have developed. Three cases of ruptured arteriosclerotic aneurysm of the abdominal aorta are presented to illustrate the features which made early diagnosis and surgery possible in 7 of 18 such patients admitted to the Albany Hospital in the last 5 years. Operation was performed in 6 of the cases presented with success in 4 and temporary success in 2. The seventh patient died during the course of the operation.

—*Robert A. Nabatoff, M.D.*

Internal Carotid Artery Thrombosis. Brooke Roberts, Gerald W. Peskin, and Francis A. Wood. *Arch. Surg.*, 1958, 76: 483.

It is now appreciated that a considerable number of cerebral vascular accidents are the result of thrombotic occlusion of the carotid artery. The etiologic factors responsible for this condition appear to be varied and include thromboangiitis obliterans, trauma, and thrombosis of a cerebral aneurysm, but in the majority of these patients arteriosclerosis appears to be the responsible antecedent. Fortunately, the carotid bifurcation is more commonly involved than is the siphon, and occlusions usually begin at or just distal to the origin of the internal carotid artery, an area which is surgically accessible. Prior to actual occlusion by thrombosis the progressive arteriosclerotic changes narrow the lumen of the artery and thereby reduce the flow through it. This phenomenon accounts for the transient premonitory symptoms and signs experienced by many patients and permits prophylactic therapy at this time. The predilection for men and the occurrence in middle age are characteristics similar to those of other occlusive vascular processes.

The definitive diagnostic test is arteriography. A radiopaque dye is injected percutaneously into the common carotid artery. If the findings on palpation or the retinal artery pressure determination are suggestive of occlusion, arteriography should be carried out promptly.

Within the last few years, promising results have been achieved by endarterectomy, by excision of stenotic areas with restoration of continuity, and by vascular grafting. The authors have operated upon 4 patients in an attempt to restore flow through a thrombosed internal carotid artery. In no instance was the patient's condition made worse by operation. The technical difficulties in attempting to clean thrombus from the intracranial portion of the internal carotid artery can be formidable because of the tortuosity of the vessel in this area and the lack of exposure. In only 2 of the 4 patients could the flow through the vessel be re-established. The authors believe that thromboendarterectomy is the treatment of choice in most cases. Although there is some danger of displacing a portion of the thrombus into the distal cerebral circulation when performing an endarterectomy, the pressure present in cerebral vessels tends to resist embolization when the proximal end of the internal carotid artery is occluded. In only 1 of these 4 patients was the operation undertaken within 36 hours of the development of the occlusion, and in this patient alone was there significant neurologic improvement postoperatively. —*Robert A. Nabatoff, M.D.*

Arterial Repair During the Korean War. Carl W. Hughes. *Ann. Surg.*, 1958, 147: 555.

This article represents an attempt to compile an accurate statistical study of all major vascular injuries reported in the literature from the Korean War. Stress is placed on the importance of resuscitation and evaluation of the patient for priority of care after all injuries and for the ability of the patient to withstand the additional operating time required for vascular surgery. The fact that there was a 13 per cent amputation rate following the suture repair of major arteries in the Korean War speaks for itself when compared with the amputation rate of 36 per cent resulting from such repairs in World War 2. The low amputation rate of 13 per cent becomes even more impressive when compared with the 51 per cent amputation rate which resulted from the ligation of major arteries in this series. It was noted that the results were generally better in those vessels repaired within 10 hours after injury. An analysis of the literature reveals 304 major vessel injuries treated and recorded from April 1952 to the end of the Korean War. Of the 304 major vessels treated, 269 were repaired and 35 ligated. An evaluation of the methods of repair of severed vessels showed that the best results were obtained after anastomosis, the next best using autogenous vein grafts, and the poorest results followed the use of arterial homograft. —*Robert A. Nabatoff, M.D.*

A Vena Cava Filter for the Prevention of Pulmonary Emboli. M. S. De Weese and D. C. Hunter, Jr. *Bull. Soc. internat. chir.*, 1958, p. 17.

The authors conceived that it might be feasible to construct an intraluminal filter of textile filaments within the vena cava. Such a filter could potentially block the transit of emboli without significantly disturbing the function or dynamics of the venous system. This is a report of their observations with such a filter in the experimental laboratory.

Forty-one mongrel dogs were utilized in the study. Eleven of these served as controls. The experimental results indicate that intraluminal filters of the type employed are well tolerated by the vena cava and that they rapidly become intimalized. Of the two types of filter subjected to trial in animals, an oblique grid composed of closely-placed parallel sutures appears to be superior to one of radial design. Venograms and venous pressure studies indicate that the filter does not produce significant early or late disturbances in venous blood flow from the lower extremities. Filters placed in the vena cava proved effective in blocking potentially lethal emboli introduced into the femoral veins of these experimental animals. However, the authors state: "We must conclude that filters of the type we have employed do not

offer complete permanent protection against repeated thromboembolic episodes. Multiple filters or filters of more rigid construction might correct this discrepancy." From this study the authors believe that the filter principle is therapeutically feasible and that it is deserving of clinical trial in patients who would otherwise be subjected to ligation of the vena cava.

—*Robert A. Nabatoff, M.D.*

BLOOD; TRANSFUSION

The Hemorrhagic Screening Tests. MURRAY NUSSBAUM, ROBERT TODARO, and ARTHUR SAWITSKY. *N. York State J. M.*, 1958, 58: 1270.

NORMALLY, hemostasis depends upon a balance between vascular factors, platelet factors, and the interplay between coagulation proteins and naturally occurring anticoagulants. Hemorrhage in any case of generalized bleeding is due to an abnormality affecting one or more of these factors. The authors present a simplified scheme of the coagulation process divided into three phases for convenience of diagnosis. From a physiologic point of view, however, it consists actually of two stages, an initial slow phase and a rapid phase with formation of thrombin enhancing platelet lysis and conversion of labile factors to more highly active forms. The authors list the abnormalities affecting hemostasis in four groups: (1) vascular abnormalities, (2) platelet abnormalities, (3) coagulation factor deficiencies, and (4) circulating anticoagulants. Examples of each are listed. The hemorrhagic screening test calls for a (1) platelet count, (2) tourniquet test, (3) bleeding time, (4) clotting time, (5) prothrombin time of plasma, and (6) prothrombin time of serum (consumption test). The above series of tests comprise the hemorrhagic screening procedure. All of the factors concerned with hemostasis have been tested. If no abnormality has been detected it can be stated with some degree of certainty that no generalized bleeding tendency exists. Additional diagnostic procedures are necessary to define the specific factor at fault if abnormalities are found. —*Allan D. Callow, M.D.*

The Distribution of the ABO and Simple Rhesus (D) Blood Groups in the Republic of Ireland from a Sample of 1 in 37 of the Adult Population. W. E. R. HACKETT and G. W. P. DAWSON. *Irish J. M. Sc.*, 1958, p. 99.

LITTLE IS KNOWN concerning the detailed ABO patterns in small areas of the world and the authors believe that discovering such patterns may be of value because of the light thrown thereby on the origins of populations, stability of blood group frequencies over long periods, and the etiology and geographical pathology of disease shown to be associated with blood group genes. Isolated, peripheral or island peoples are particularly worthy of such study because they are least subject to constant mixing with contiguous populations. As a peripheral island people the Irish are thus an appropriate nation for blood group investigations.

The present study adds 33,802 further Irish groupings to the country-of-birth survey of 21,894 groupings previously published and summarizes the work on the basis of the new total of 55,696. Simple Rh blood groupings were also performed on these individuals. In the ABO group pattern the striking feature is a high incidence of group A in those areas of the Republic of Ireland which have received the bulk of Anglo-Norman and later English population settlements since the twelfth century A.D. The east of Ireland has more Rh negative individuals than the west and the reason is not clear. There is need for the collection of more Irish ABO and Rh blood group data, and for the establishment of special blood group programs to discover the frequency of the genes of the other blood group systems in the main parts of Ireland.

—*Allan D. Callow, M.D.*

Plasma Transfusion Without Transmission of Serum Hepatitis. PAUL I. HOXWORTH and WALTER E. HAESLER, JR. *J. Am. M. Ass.*, 1958, 166: 1291.

FROM WORLD WAR II came the information that the virus of serum hepatitis in human carriers may disseminate in pools of plasma and produce serum hepatitis in a high percentage of patients. Efforts to solve this problem have consisted of attempts to destroy viral activity with chemicals, ultraviolet irradiation or prolonged storage of liquid plasma at room temperatures, return to the use of group specific plasma, and substitution of virus-free protein fractions of plasma and unnatural plasma volume expanders. Ultraviolet irradiation has been costly, the addition of chemicals is not practical, group specific plasma usage is cumbersome, and methods for the preparation of fractions waste albumin and other proteins. Because of these problems much blood plasma is currently being wasted.

In 1951 Allen proposed that the storage of liquid plasma at room temperature for six or more months might inactivate the virus of hepatitis insofar as human transmission is concerned. This article gives the results of an investigation for the 4 year period of January 1953 to January 1957 at the University of Cincinnati blood transfusion service. Plasma was prepared from the pooled blood of 30 to 72 donors and stored at room temperatures (72 to 95 degrees F.) for six months before release. Ultraviolet irradiation was not employed but otherwise standards of processing conformed to those of the National Institutes of Health. In this time hepatitis was not detected in 282 recipients exposed to the plasma of 492 donors. This is in sharp contrast to all previous experiences with untreated and irradiated pooled plasma. In these groups the infectivity has ranged from 1 per cent in small pools of 6 or 8 up to 22 per cent in large pools. Adequate clinical experience was gained during this study in the Department of Surgery at the University of Cincinnati to attest to the suitability and effectiveness of the program. In their laboratory no new problems in sterility and pyrogen controls were introduced. Plasma which is kept sterile and free of pyrogens during the processing will remain so for an indefinite period in the standard final containers. Less than 1 per cent of the plasma prepared during the time of this study was discarded due to bacterial contamination. Human pyrogen tests were negative for all lots and transmission of bacterial disease was not encountered. The alteration in albumin induced by storage of plasma as a liquid for months is minor.

—*Allan D. Callow, M.D.*

RETICULOENDOTHELIAL SYSTEM

Successful Marrow Homograft in the Dog After Radiation. Joseph W. Ferrebee, Harry L. Lochte, Jr., Alfred Jaretzki, III, Otto D. Sahler, and E. Donnall Thomas. *Surgery*, 1958, 43: 516.

Homologous bone marrow was given to irradiated dogs, with one successful transplant. The animals were prepared by two methods: (1) one group was given ACTH and was splenectomized in addition to receiving radiation; and (2) the other group was given radiation alone.

The surviving male dog had been given female homologous marrow as a transplant, making it possible to verify the survival of the transplanted marrow by counting the female forms of the circulating leucocytes.

At present no one is certain about the survival time of the homologous marrow. In this experiment the dog appeared to be doing well 30 days after homografting. Other investigators have reported survivals of up to 7 months. The reaction of the host to the donor can be delayed by radiation and the use of ACTH. Eventually, however, an immunologic response seems to occur. The authors believe that the host in this experiment will not develop an immunologic response to the donor since they were siblings and the transplant was from female to male.

—*Richard E. Gardner, M.D.*

LYMPH GLANDS AND LYMPHATIC VESSELS

The Importance of Lymphangiography in Surgery (Die Bedeutung der Lymphangiographie in der Chirurgie). R. Gergely. *Chirurg*, 1958, 29: 49.

Chronic edema of the lower extremities presents a difficult surgical problem. Although arterial insufficiency may be differentiated by characteristic symptoms, venous and lymphatic insufficiency has edema as the common denominator. Lymphangiography demonstrates the pathological changes and character of the lymphatic circulatory system. The arterial and venous lymphatic circulation are in interrelation with co-ordinating nervous, humoral, and mechanical factors.

Experimental lymphangiography with thorotrast injections into the lymph nodes and subcutaneously was introduced by Monteiro in 1930. Due to lack of absorption of the contrast and oil media and the fact that such injections are painful, the use of lymphangiography in human beings is limited. Even water soluble contrast materials when injected subcutaneously into the mucosa and joint space give inadequate filling of the lymphatic vessels.

Lymphangiography by direct injection of contrast materials into a dilated lymphatic vessel, as first practiced by Servelle, is technically only rarely possible, even in a diseased lymphatic system. The first practical method for investigating the lymphatic vessels in the human being was introduced by Kinmonth and Taylor (*Ann. Surg.*, 1954). After incision into the subcutaneous tissues, the lymphatic vessels are visualized by means of a subcutaneous injection of a diffusible dye and injected with the radio-opaque material. The authors report the result of 50 studies of extremities with normal and pathological lymphatic systems using a similar technique.

In the study of the normal lymphatics, the author used 70 per cent ioduron and triopac "400" with no complications. The lateral, medial, or both systems were visualized after the injection of a single lymphatic vessel. The characteristic of a normal lymphatic system is its small capacity, so that only a small amount of dye can be injected and then only under high pressure. At rest the centripetal progression of the contrast material is very slow, while active or passive motion helps its progress. Roentgenography should be performed immediately after the injection, as the sharp outline of the vessel is replaced by a hazy one because of permeation of the contrast material through the lymphatic vessel wall.

A normal lymphatic system was demonstrated in extremities of several patients up to one-half a year after an episode of thrombophlebitis. In chronic cases lymphatic vascular changes were demonstrated. One patient with phlebographic demonstration of occluded and partly recanalized deep leg veins showed a marked increase of recanalization and irregular, tortuous lymphatic vessels. In cases of lymphedema, lymphangectasias were demonstrated. Lymphangiography in such patients is easy to perform as the capacity of the lymphatic system is increased up to 20 or 30 cu. ml.; percutaneous injection of contrast material will give an adequate visualization of the lymphatic vessels in an occasional case. The lymphatic vessels are characteristically thickened, tortuous, and with areas of dilatation and constriction. Because of insufficiency of the valves, retrograde filling is observed.

Lymphatic tumors may be visualized by direct percutaneous injection after aspiration of lymphatic fluid.

—*Karel B. Absolon, M.D.*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Trendelenburg's Operation; Pulmonary Embolectomy. K. VOSSSCHULTE. *Germ. M. Month.*, 1958, 3: 69.

THE HISTORY of pulmonary embolectomy, an operation first suggested by Trendelenburg in 1908, is reviewed on the basis of published reports. Eleven of 15 successful embolectomies were performed between 1924 and 1939, while between 1941 and 1956 only 4 successes were reported.

The operation has been attempted much less often in recent years, despite the failure of anticoagulant treatment consistently to prevent thromboembolism. This failure is illustrated by the experience of the Department of Surgery of Giessen University where the incidence of embolism has increased steadily in recent years in spite of the prophylactic use of anticoagulants.

It is argued that resuscitation depends primarily not on the ability of the brain to withstand interruption of the circulation, but on the condition of the myocardium immediately after the circulation has been re-established. The maintenance of artificial respiration is essential for a successful outcome of any resuscitation attempts. A successful case of pulmonary embolectomy is described. Electrocardiograms became normal in the course of the first 24 to 48 hours postoperatively.

It is pointed out that the decision to perform an embolectomy must be made while the patient is still breathing spontaneously.

—John J. Maloney, M.D.

Control of Bleeding After Dermabrasion. WALTER SCOTT BROWN. *Northwest M.*, 1958, 57:470.

ONE OF THE drawbacks of the dermabrasion method of removing scar tissue has been the oozing type of bleeding encountered during operation and in the postoperative period. The purpose of this article is to offer a preliminary report on the use of adrenosem salicylate, a systemic hemostatic agent, in dermabrasion procedures in an attempt to evaluate its ability to control bleeding, primarily that which occurs postoperatively.

Cheek sanding was decided upon so that the two sides could be done with and without adrenosem and the relative blood loss compared. The blood loss was measured by weighing the sponges. The operative procedure was the same for both cheeks excepting the administration of adrenosem prior to surgery on the second cheek. A period of thirty minutes was allowed for the adrenosem to exert its effect and then the operative procedure was repeated on the remaining cheek.

Over the past 2 years approximately 200 dermabrasion procedures have been completed using this procedure. Averaging the calculated amount of blood loss between the treated and untreated cases of the entire series, it was found that after treatment there was an average calculated reduction of loss of 47.9 gm. of blood per patient.

It should be mentioned that adrenosem salicylate is compatible with any type of anesthetic and can be given simultaneously. Also, it has no sympathomimetic action.

—Arthur M. Simpson, M.D.

Prophylaxis of Thrombosis and Embolism, Statistics of the Clinic in Tübingen (Die Prophylaxe der Thrombose und Embolie, Erfahrungsbericht aus der Tübinger Klinik). W. DICK. *Medizinische*, 1958, p. 543.

ACCORDING to statistics, fatal pulmonary embolism is clinically not recognized in approximately one third of all cases. In five-sixths of all cases of fatal pulmonary embolism the original thrombosis remained asymptomatic. Three-fourths of all patients with fatal embolism died within 15 minutes after the occurrence of this complication. All such statistical data emphasize the importance of prophylactic treatment. Improvements in anesthesia, the introduction of antibiotics, newer methods of avoidance of shock, and careful attention to the maintenance of electrolyte balance should reduce the incidence of thromboembolism. On the other hand, a rise in life expectancy, the increased frequency of nutritional disturbances and circulatory disorders, and some unknown factors favor thromboembolism, the incidence of which has not been reduced in the last decade. In the order of descending frequency the following conditions were responsible for postoperative death in the Surgical Clinic of Tübingen: cardiac failure, pneumonia, peripheral circulatory failure, cerebral incidents, and, finally, embolism.

Statistics concerning the effectiveness of prophylaxis of embolism are not convincing because comparative studies are lacking. Therefore, the author has been employing the anticoagulant therapy since January, 1956 in each alternating case, excluding only patients in whom such treatment was contraindicated by old age, hypertension, hemorrhagic diathesis, hepatic or renal diseases, ulcers of the digestive tract, or ulcerating, inoperable tumor anywhere in the body.

Anticoagulants were employed in 2,200 patients while the control group consisted of 2,320 patients.

The number of appendectomies, gastric resections, cholecystectomies, and operations on the large bowel was approximately the same in both groups. In the group treated with anticoagulants there were 5 pulmonary infarcts and one fatal pulmonary embolism. In the control group there were 12 cases of fatal embolism, 19 of infarcts, and 33 of thromboses of the legs without infarct. Serious hemorrhages occurred 23 times in the first group and 6 times in the control group. Antibiotics increase the response of the organism to heparin whereas they reduce the effectiveness of dicumarol.

Early ambulation is advocated by the author because it improves the circulation and therefore may have a prophylactic value.

—Joseph K. Narat, M.D.

Significance of Fatal Pulmonary Embolism in Immediate Postoperative Period. M. C. ANDERSON and T. W. SHIELDS. *J. Am. M. Ass.*, 1958, 167: 422.

FACTORS that might predispose a patient to fatal postoperative pulmonary embolism were sought in a study of 943 autopsy records representing 10 years' hospital experience. Pulmonary embolism was demonstrated in 118 cases, and considered the primary cause of death in 49. In 22 instances, fatal pulmonary embolism followed a major operation, and 4 of these deaths occurred during the first 24 hour period after surgery.

The relationship between fatal pulmonary embolism and such factors as age, sex, types of operations performed, timing between operation and death, and timing between the onset of symptoms and death, are comparable to those observed by others.

Several findings were considered worthy of further consideration:

1. Four of the 22 deaths occurred during the first 24 hour period following operation.

2. Low grade fever and tachycardia were present preoperatively in 5 of 6 patients who died within the first 72 hours after operation.

3. In almost half of the cases, postoperative fatal pulmonary embolism was preceded by a period of restricted physical activity, imposed either by the nature of the patient's disease or the hospital confinement.

These findings suggest that an underlying thrombotic process was present at the time of surgery. Therefore, careful preoperative evaluation, and institution of measures to prevent incipient thrombosis in the preoperative period would seem to be of equal importance to those routinely recommended during the postoperative period.

Postoperative Metabolic Changes; In Relation to Nutritional Regimen. WILLIAM E. ABBOTT, HARVEY KRIEGER, and STANLEY LEVEY. *Lancet*, Lond., 1958, 1: 704.

ELEVEN WOMEN and two men about to undergo elective cholecystectomy were given one of the three following regimens in the 3 day control and postoperative periods:

Group A. Three women and two men were given only 5 per cent dextrose in water intravenously.

Group B. Four women were given only 5 per cent dextrose in water to which was added about 90 mEq. of sodium and 80 mEq. of potassium daily.

Group C. Four women were given 5 per cent protein hydrolysate in a 10 per cent fructose solution to which sodium and potassium were added to provide a daily intake of 90 mEq. of sodium and 80 mEq. of potassium.

The data obtained in the study of the patients in group A show that the deficits of sodium, potassium, and nitrogen were not appreciably influenced by anesthesia and uncomplicated cholecystectomy. Measured by sodium, potassium, and nitrogen balances, the postoperative metabolic response of the 3 patients in group B who had no complications was essentially the same as that of the patients in group A and the 3 healthy volunteers in the control period.

The deviations from equilibrium of potassium and nitrogen of the patients in group C were less than those shown by the patients in the two other groups. Most of the patients showed smaller sodium deficits during the postoperative period than during the control period. The potassium intake was adequate to maintain these 4 patients, who received a modest amount of protein and calories, close to equilibrium. These 4 patients lost less body-weight than those who were not given nitrogen.

All the patients showed a fairly abrupt increase in the urinary excretion of 17-hydroxycorticoids on the day of operation or the first postoperative day. Over the next 2 to 4 days these values gradually returned to normal. There was no correlation between the nitrogen or electrolyte balance and the amount of 17-hydroxycorticoids excreted.

The data obtained from this study substantiate previous findings, that operative trauma and anesthesia per se are only minor factors in determining the pattern of the metabolic response to surgery. The major factors are the dietary regimens, the complications, the previous nutritional state, and the sex of the patient. The intravenous infusion of a suitable protein hydrolysate, when supported by adequate calories, will either minimize or prevent postoperative wasting of nitrogen and loss of weight, if complications are avoided. After an uncomplicated operation, the usual patient who does not have extrarenal losses should receive daily 75 to 125 mEq. each of sodium and potassium. Such intakes should maintain a sodium and potassium balance near equilibrium or prevent appreciable deficits and excesses.

—*Mary Frances Poe, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Some Orthopedic Aspects in the Course of Burns (Quelques aspects orthopédiques de l'évolution des brûlures). P. COLSON, P. STAGNARA, R. HOUT, and P. LECLERCQ. *Sem. hôp. Paris, Ann. chir. plast.*, 1958, 3: 61.

SPECIAL ATTENTION is directed to superficial burns of the anterior surfaces of the legs and dorsal surfaces of the feet by boiling fluids. Whether the wound heals spontaneously or by the application of grafts, walking is resumed after 5 to 6 weeks. After a period of 3 months, however, some patients return complaining of pain on walking. This may be due to a hard edema stretching the scars. Roentgen examination may reveal osteoporosis, always more severe at the level of the calcaneus and not in proportion to the severity of the burn. Such disorders may be related to the reflexogenic action of the burn or possible predisposition of the patient. Occasionally the osteoporosis is the only objective symptom and its medicolegal significance is therefore important. Osteoporosis following a slight burn justifies prolonged treatment if relapse is to be avoided. Pains may not develop until a long time after the burn has healed.

In severe burns treatment may lead to rapid recovery, the patient being allowed up at the end of the second month, having then already been subjected to respiratory gymnastics and routine muscular reeducation for several weeks. Once the patient is upright circulatory disturbances that may affect the course of healing of the skin may occur. Cyanosis

will appear more pronounced in the grafted areas, with neoformed capillaries, tiny ruptures of the blood vessels, ecchymotic spots and angiomatous blotches, varicose confluescences, or keloid bands. Treatment of these circulatory disturbances is difficult. Neither angiotonic nor vasoconstrictor drugs yield much relief, nor does moderate compression with elastic bands. Young grafts appear to be more sensitive to venous inundations than older grafts. The circulatory disturbance, per se, is of little interest except as an aid in judging the role of deeper vasomotor disturbances affecting the whole limb. It has been suggested that lesions of the venous intima caused by reflux of heated blood may be one reason for the intensity and persistence of circulatory disturbances.

The cause of difficulties encountered upon resumption of walking includes 3 types of lesions, namely: (1) skin lesions: torpid ulcerations, retractile bands, and fragile or painful scars; (2) atrophy of muscle masses and nerve disturbances; (3) bone changes, including osteoporosis and osteolysis. It is emphasized that the foot does not present the complexity envisaged by various writers in studies of vicious scars as orthopedic sequelae of burns. A sensitive area for retraction is located at the level of the knee and popliteal space. Preventive therapy consists of the proper placing of grafts. Primary attention to the popliteal area will prevent secondary retractions. Z-plastic intervention is inadequate to liberate limited knee movement.

Atrophy of the muscular masses and reduction in tonus are almost constant sequelae of severe burns. Therapeutic efforts should be directed to the muscle itself, including massage, exercises, and kinesiotherapy. A tendency toward muscular retraction can be combated with corrective plasters or elastic traction apparatus. The present authors have never used tenotomy.

In 3 cases a paralysis of the external popliteal sciatic nerve was observed; in one case it was bilateral. Paralysis may affect this nerve and the cubital nerves electively without any direct lesion of the nerve trunk or any indications of compression by the bandage.

The osteoarticular changes include osteoporosis and osteolysis. Routine roentgen studies will reveal an astonishing frequency of osteoporosis. In osteoporosis developing in a burned patient it is necessary to recognize the part played by infection in changes of the articular epiphyses. Osteoporosis, per se, however, may create serious joint disturbances due to erosion of the surfaces and dislocation. At the level of the ankle it is important to avoid the fixation of equinism in decubitus. This is easy when cicatrization is rapid but difficult in torpid wounds. It must be kept in mind that pressure exerted by the cast is unfavorable to cicatrization. The authors recommend successive corrective plaster casts and repeated grafts.

Abnormalities at the hip level are most serious as regards the functional future of the patient, with possibilities of complicating arthritis, osteochondritis, or exostoses.

In the late stages the bone changes may show an osteolysis comparable to the sequelae of tuberculous arthritis. These changes are due less to circulatory disturbances than to a metabolic disturbance and require further study to determine the respective roles of the connective tissue and the mineral composition. It is concluded that many of the orthopedic sequelae encountered in burned subjects develop late in convalescence. Their prevention is best provided for by prompt and adequate treatment of the burn. In growing children the resulting skeletal changes are frequently not recognized until the period of convalescence. Routine roentgen studies will help to reveal the initial stages and permit prompt adequate treatment. —*Edith Schanche Moore.*

Complications of Burns. JOHN A. MONCRIEF. *Ann. Surg.*, 1958, 147:443.

AT THE SURGICAL RESEARCH CENTER, Brooke Army Medical Center, Fort Sam Houston, Texas, from 1950 through 1956, more than 1,000 patients were treated for thermal injury of varying degrees. The purpose of this discussion is not to give any impression of accuracy as to frequency of occurrence, but to indicate the types of complications that may occur. The treatment and results noted are those of the early postburn period.

When the ears are involved there is always the possibility that the cartilage will be damaged. It is by no means an exclusive rule that the deeper the burn the greater the chance of a chondritis developing, and certainly chondritis is not frequent enough to warrant early prophylactic excision of the cartilage. The only mode of treatment that proved to be of value was surgical removal of all the nonviable and infected cartilage of the helix, antihelix, and other portions of the ear, if necessary, through an incision involving the entire margin of the helix. This procedure results in relief of the almost constant pain, but it does not prevent a marked deformity of the ear.

Another complication of burns of the face that occurs quite frequently is ectropion of the eyelid. The longer any surgical intervention can be delayed in these cases, thus allowing scar tissue maturation to occur, the better will be the cosmetic result. This course of events should be followed if at all possible. However, when ectropion is severe, it is mandatory that a tarsorrhaphy be done to prevent corneal ulceration. The primary aim in correcting ectropion is a good functional result. The cosmetic result is a secondary consideration. A large degree of overcorrection is carried out because of the continued and progressive scar tissue contracture that occurs during the postburn period and for many months thereafter. If this condition is not adequately overcorrected, a recurrence of the ectropion will invariably develop.

Probably the most disheartening complications to both patient and physician are those developing as the result of thermal injury to the hands, particularly injury involving the extensor mechanism. The palmar surface of the hand rarely sustains full-thickness involvement; however, the extensor portion of the hand does not escape such injury, and frequently it suffers full-thickness loss. Infection frequently occurs in the area and results in functional loss, even though the structures may have escaped

permanent damage from the thermal injury. In general, the complications of digital burns should be handled by persistent, active, and prolonged physiotherapy. Considerable return of function will result. The deformities resulting are marked flexion deformities and if physiotherapy is not correcting this and the flexion deformity is progressing, then the only procedure left is fusion in an attempt to prevent further deformity and place the joint in the position of maximum function. Fusion can be accomplished by inserting small caliber Kirschner wires into the proximal and middle phalanges of the involved digits. It is of extreme importance to keep burned hands elevated to assure adequate lymphatic drainage. Otherwise a brawny, indurated edema of the hand occurs, and, in spite of intact tendon and joint mechanisms, a frozen hand is produced.

When circumferential third-degree burns of the extremities occur, the eschar is inelastic and results in a very effective ischemia. If untreated, avascular necrosis of muscle groups and entire extremities is frequent. The only effective measure is relief of the compression by splitting the eschar widely.

Burns are occasionally of such a depth or location that they involve the underlying bone. At the initial examination of a deep third-degree burn, it is usually impossible to say whether or not the periosteal involvement is significant enough to result in necrosis of underlying bone. Usually by the time spontaneous separation of the eschar occurs, viability of the periosteum can be determined. A surgeon should be able to determine whether or not the periosteum is viable. If it is not, additional operative procedures must be performed. When skull periosteum is nonviable, efforts must be made to stimulate granulations to cover the exposed bone. The simplest and least traumatic procedure is to drill the outer table of the skull with a large dental drill to permit the granulating buds to grow out the holes. An alternative procedure is to remove the outer table as soon as it is felt that the periosteum is nonviable to enable granulations to be produced from the marrow. As soon as granulations are present, grafting can be carried out without difficulty. Deep burns involving the superficial portions of the long bones, joints, and the bones of the hands and feet are not uncommon. It must be emphasized that the cortical bone should not be removed in the early postburn period. Wait until it is quite evident that no granulations will form and that the only source possible is the marrow cavity of the involved bone.

The neurologic complications attendant upon thermal injury are dependent upon the improper use of therapeutic measures designed for treatment of the burn wound, the most common being the application and prolonged use of tight compressive dressings over areas where the peripheral nerves are quite superficial. In cases in which direct thermal injury to nerves does occur, the primary object of treatment is skin coverage of the involved area; only under these circumstances will the infection in the area resolve. Unless infection is controlled, there is no opportunity for regeneration of the nerve, hence no therapeutic surgical procedures should be carried out. To prevent nerve damage due to pressure, dressings and immobilizing casts should be changed frequently.

Ocular and visual complications are seldom observed since very few occur as a direct result of thermal injury. Most of these are localized third-degree burns caused by phosphorus. Progression of this injury by prolonged contact with the burning agent, such as phosphorus, and the added destructive effects of infection and drying can be completely prevented if adequate prophylactic measures are carried out. Irrigation of the eyes with copper sulfate solution and the meticulous removal of the remaining phosphorous fragments are mandatory. The prevention of corneal erosion secondary to drying of the eye or a purulent conjunctivitis spreading from the surrounding burned tissue is the responsibility of the attending surgeon. Surgical intervention is required in many cases in the form of an ectropion correction or a lid tarsorrhaphy. It is also mandatory that eye care be carried out. Therapy consists of frequent daily irrigations of the eyes with a saline solution and repeated application of ophthalmic antibiotic ointments after each irrigation.

The complications involving the genitourinary system, in most instances, are those connected with the therapy instituted rather than those resulting from the thermal injury itself. The majority of these complications are caused by indwelling urethral catheters. One of the most common complications of catheters is a periurethral abscess. The only treatment that is satisfactory is incision and drainage, continued catheter drainage in an attempt to prevent a urethral fistula, and closure of the wound by secondary intention. It is obvious that the best way to avoid this complication is to remove the urethral catheter as soon as possible. With prolonged catheter drainage and the almost absolute immobilization necessary in extensive burns, one must always bear in mind the possible development of a renal or bladder calculus.

One of the most serious complications of therapy in thermal injury is that of homologous serum jaundice. Blood and plasma are implicated as the etiologic carriers in approximately an equal number of cases. To subject such a patient to any type of general anesthesia or any major surgical procedure during this period of hepatic disease and its immediate recovery period is contraindicated. It is fortunate that the vast majority of the patients will probably have complete skin coverage at the time of onset of hepatic disease.

The most dramatic gastrointestinal complication is acute gastric dilatation. It demands immediate therapy and fortunately responds to therapy quite rapidly and successfully. Other common gastrointestinal complications include homologous serum jaundice (mentioned above), Curling's ulcer (not discussed), and the paralytic ileus associated with septicemia (not discussed). In burns about the face the nose is plugged so that mouth breathing is mandatory. As the patient is unable to take oral fluids properly, it is imperative that good oral hygiene be maintained.

The question of significant renal insufficiency occurring in the immediate postburn period is not

clear. Obvious derangements in renal function occur but it is not known whether these conditions are a result of the direct effect of thermal injury or of the extensive physiologic changes in a human body sustaining a burn of great severity. They are more likely to be a complication of all these factors. In the clinical experience of this Unit, patients who were oliguric in their immediate postburn period become so usually as a result of inadequate replacement fluid therapy immediately following the burn. Other patients have been encountered who failed to respond to fluid therapy. Oliguria persisted. It is probable that this is a circulatory renal insufficiency secondary to renal ischemia. Recovery should occur in 2 to 4 days. It should be emphasized that adequate resuscitative therapy immediately after thermal injury prevents this occurrence of renal insufficiency.

A patient suffering from extensive thermal injury does not escape the consequences of his forced immobilization, particularly about the joints. The most characteristic finding is a faint periarticular calcification along fascial planes or in the region of the joint capsule, most commonly occurring around the elbow. The earlier the mobilization of the joint, the less opportunity there is for complications of this type. No operative procedure should be contemplated unless no further improvement occurs in the range of motion as a result of prolonged physiotherapy.

Major tendon destruction often occurs as a result of thermal injury and subsequent infection. The relatively superficial tendons of the hand, wrist, ankle, and foot show extensive destruction most commonly. The loss of tendons by bacterial autolysis is more frequent than by direct thermal destruction. If the destruction of tendons is so extensive as to preclude any chance of functional activity, or if the structures supplied by the tendons, such as the digits and hand, are destroyed, no attempt should be made to preserve tendon function. Amputation is probably the treatment of choice. Delay in amputation may result in amputation higher up on the extremity. There is an occasional chance of maintaining the viability of less severely burned tendons through granulations that may penetrate between individual fibers of the tendon from adjacent muscle. Consequently, a surgeon should be in no great hurry to remove what appears to be nonviable tendon, particularly so if it is the only hope of retaining function to the distal organ of insertion.

Soft tissue contractures can also occur, as well as fibrosis of muscle and the connective tissue exclusive of joint capsules. Skin contractures are more likely to occur when mixed second-degree and third-degree burns involve areas about the joints, particularly when they cross flexion creases and lines of stress. If grafts are placed so that the margins of adjacent strips of skin are at right angles to the long axis of the limb, there is little, if any, opportunity for scar tissue to limit joint activity. It is best to treat soft tissue contractures with early active physiotherapy. Early excision and grafting are to be avoided if at all possible since it usually requires 12 to 18 months for a complete maturation of the scar tissue to take place. Excision of nonmatured scar is often incomplete and results in failure.

Control of infection in a burned patient is of primary importance in order to prevent the development of septicemia. Treatment of infection of a superficial burn avoids conversion of second-degree burns to third-degree burns. The most important micro-organism, Group A beta hemolytic Streptococcus, is sensitive to penicillin. Therefore only small amounts of penicillin need be given systemically as prophylaxis. If this organism is cultured from the surface wound, penicillin administered systemically will usually cleanse the wound within 48 to 72 hours. Conversion of donor sites and second-degree burns to full-thickness skin loss is primarily due to poor surgical management of the wound. If dressings over donor sites or second-degree burn wounds are allowed to remain in place for more than 4 or 5 days, the bacterial autolysis taking place beneath the burn dressing will convert partial-thickness to full-thickness loss within 12 to 24 hours. The "exposure method" must be abandoned whenever infection occurs beneath the crust of a second-degree burn.

Burns resulting from high voltage electrical contact are quite different from the usual thermal injury. The resulting burn is extremely deep and well localized to the points where the current enters and leaves the body. Considerable disability may result if the burned areas are critical from the standpoint of function. In addition, because of the depth of the wound, major vessels, nerves, and organs may be seriously or irreparably damaged. Small localized areas of third-degree involvement may be excised almost immediately and then grafted. It is important that a wide margin of excision be done to prevent failure of graft take. Complications may result that are peculiar to electrical burns, such as extensive thrombosis of deep vessels, direct destruction of the nerves and blood vessels, and incineration of muscle groups, frequently requiring amputation of the extremity distal to the point of maximum injury.

—*Arthur M. Simpson, M.D.*

Influence of Initial Vacuum on Steam Sterilization of Dressings. R. KNOX and E. J. K. PENIKETT. *Brit. M. J.*, 1958, 1:680.

IT IS generally accepted that, in the sterilization of surgical dressings by steam under pressure, air must be efficiently removed from the sterilizer and its contents before steam is admitted. But opinions are divided over the best method of removing air. All those who have studied this problem, whichever method of air removal they recommend, agree that the effect of residual air is to delay the penetration of steam into dressings and so render the attainment of sterilizing temperatures slow and unreliable. The authors have, therefore, investigated the influence of different levels of preliminary vacuum on the time taken to reach an arbitrary sterilizing temperature when the surgical packs were badly placed in the sterilizer and it was deliberately overloaded.

Forty-three experiments were recorded. It was shown that at high initial pressures, that is, low degrees of vacuum, the points (time) were scattered, but with a high initial vacuum, at pressures below 20 mm. Hg (absolute), the time taken to reach 115° C. was consistently about one minute.

The experiments here described have shown that, provided a high enough vacuum is drawn before steam is admitted, sterilizing temperatures can be reached inside a packed drum almost instantaneously, in spite of deliberate errors in loading. It seemed likely that a tightly packed load could be rapidly sterilized if a high vacuum was first achieved. In six experiments carried out to test this hypothesis they found that complete sterility was achieved in 10 minutes at 20 lb./sq. in. of steam, after an initial vacuum of 15 mm. Hg (absolute).

The authors believe their experiments show that, if high vacuum equipment is to be fitted to a sterilizer, it must be capable of reducing pressure in the chamber to at least 20 mm. Hg to ensure consistent rapid sterilization. —*Arthur M. Simpson, M.D.*

ANESTHESIA

Carbon Dioxide Retention During Hypoventilation in Experimental Animals. RICHARD H. EARLE, JOHN F. PERKINS, and WILLIAM E. ADAMS. *Anesthesiology*, 1958, 19: 153.

A STUDY was undertaken by the authors, first, to determine quantitatively the degree of hypercapnea and of respiratory acidosis which develops in experimental animals following reduction of effective alveolar ventilation while adequate oxygenation is maintained; second, to determine how much the concentration of inspired oxygen need be increased in order to maintain a relatively constant arterial oxygen saturation (near 85 per cent) as the alveolar ventilation is reduced; and third, to evaluate the reliability and usefulness of the "alveolar equations" in predicting such changes.

Alveolar ventilation was reduced in step-wise fashion in dogs, and inspired oxygen was simultaneously increased just enough to keep arterial saturation, measured by cuvette oximeter, near 85 per cent. Under these conditions there is an approximately reciprocal relation between effective alveolar ventilation and arterial pCO_2. A similar reciprocal relationship also exists between alveolar ventilation and the inspired oxygen tension (minimal pIO_2) required to maintain oxygen saturation near 85 per cent. There is an approximately linear relation between minimal pIO_2 and both arterial pCO_2 and hydrogen ion concentration. With extreme reduction in ventilation requiring 100 per cent oxygen to maintain adequate oxygenation, arterial pCO_2 reached nearly 400 mm., and pH 6.5, the acidosis having both respiratory and metabolic components.

Certain logical consequences of the data presented here may have practical application in the field of anesthesiology, as follows:

1. It is obvious, as predicted by the "ventilation-metabolism" equation, that a decrease in effective alveolar ventilation will produce a proportional increase in arterial carbon dioxide tension, provided oxygen consumption is relatively constant.

2. If it becomes necessary to increase the concentration of oxygen in the inspired air in order to maintain adequate oxygenation (assuming relatively normal cardiopulmonary function), then one has evidence of a proportional decrease in effective alveolar ventilation, as predicted by combination of the "ventilation-metabolism" equation with the "alveolar gas" equation, and as determined experimentally.

3. In the situation in which adequate oxygenation is maintained by a given increase in oxygen tension, then, as predicted first by the alveolar gas equation and second by an equation relating pCO_2 to hydrogen ion concentration, there will be a roughly proportional increase in both factors; this has been confirmed by the experimental data.

Thus, when hypoxia due to hypoventilation is corrected by adding oxygen, the inevitable consequence is retention of carbon dioxide and respiratory acidosis. The possibility is raised of using an earpiece oximeter as an aid in regulating assistance to respiration in order to prevent hypoventilation, adequate oxygenation being maintained in the majority of patients on considerably less than 100 per cent inspired oxygen. —*Mary Frances Poe, M.D.*

Hypoventilation and Hyperventilation During Anesthesia for Thoracic Surgery. C. RONALD STEPHEN, LEONARD W. FABIAN, SARA DENT, and MICHEL BOURGEOIS-GAVARDIN. *J. Am. M. Ass.*, 1958, 166: 1678.

DURING THORACIC SURGERY several factors, acting singly or in combination, may interfere with normal ventilation. The common denominator of these several forces is the diminution of gaseous exchange at the alveolar membrane. It is agreed that respiratory acidosis is the result of inadequate alveolar ventilation, and should be prevented in the best interests of the patient. In clinical practice difficulty has arisen in preventing respiratory acidosis and hypoxia because there are no clear-cut signs to indicate their presence.

An effort has been made to study clinically the effects of hyperventilation in 128 patients who underwent thoracic surgery.

In the majority of patients, ventilation was achieved by manual compression of the reservoir bag, although in about 20 the mechanical ventilators were used. The carbon dioxide tension was calculated from the carbon dioxide content in volumes per cent, and the pH was determined by use of the nomogram of Peters and Van Slyke (Henderson-Hesselbach equation). Arterial oxygen saturations were determined in a Wood cuvette oximeter.

It seems apparent from this study that, in a majority of patients undergoing thoracic surgery, a state of alkalosis or a normal range of acid-base balance may be obtained by employing controlled respiration with a conscious effort to achieve hyperventilation. This method may therefore serve as a technique to avoid undesirable respiratory acidosis. The possibility exists that controlled respiration, altering respiratory dynamics as it does, may interfere with venous return and cardiac output. If performed improperly, such may be the case. During controlled respiration one of the most important signs of depth of anesthesia is lost. Under these conditions anesthetics should be employed in such concentrations and quantities that it is virtually impossible for deep planes of anesthesia to be attained. No ill-effects from alkalosis were seen even in patients kept in that state for several hours.

The authors conclude that an extensive evaluation of the relative merits of respiratory acidosis and alkalosis is desirable. —*Mary Frances Poe, M.D.*

Anesthesia for Radiation Therapy Under an Oxygen Tension of 3 Atmospheres (Anesthésie pour radiothérapie sous une pression de trois atmosphères d'oxygène). S. A. KLEIN. *Acta anaesth. belg.*, 1957, 8: 117.

GRAY AND ASSOCIATES, performing animal research in 1953, demonstrated an elevated sensitivity of tumors to irradiation under elevated oxygen pressure. Bert, in 1878, demonstrated that oxygen under pressure is toxic to the human organism. He observed spasms resembling epileptic convulsions which were caused either by enzymatic disturbance of the cerebral tissues or by an accumulation of carbonic acid in the cells from diminished circulation.

Completely new horizons were opened to the radiologist by Churchill-Davidson, radiologist, Thomlinson, pathologist, and Sanger, anesthesiologist, in one of the London hospitals when they applied Gray's technique to human patients.

The living organism is, without doubt, influenced by oxygen under pressure, and in view of the increased influence resulting from intensive irradiation, this radical treatment should be used with the necessary precaution; however, the favorable results obtained do justify the application of this last resort.

Some anesthetics, such as chloroform, barbiturates, and chlorpromazine appear to combat the spasms, but they do not suppress the spasms caused by damage to the nerve cells. Several experimenters, including Bert, state that the spasms are diminished under the influence of narcotic substances, whereas they are increased and accelerated by muscular contractions, heat, and cold, as well as by inhalation of carbon dioxide. Bert states that with elevated oxygen pressure cerebral circulation is diminished to 75 per cent and vascular resistance of the cerebrum is elevated to 55 per cent. These phenomena are declared to represent a natural protection of cerebral tissue against the elevated pressure. Hence, carbonic acid, causing dilatation of cerebral vessels, is an unfavorable influence, whereas narcotic substances perhaps can produce a contrary, i.e., protective result. General anesthesia is necessary to keep the patient unaware of a 3 hour irradiation treatment in a closed metallic cage. This presents a special difficulty: the anesthetist, after inducing the anesthesia, has to retire from the no longer healthy environment of the hermetically closed cage.

The British doctors use a long-acting anesthesia. Premedication consists of two doses of phenobarbital, 100 mgm. during the night. In addition the patient is given 100 mgm. of dolantine, 50 mgm. of largactil, and two doses of atropine, 0.5 mgm., within 2 hours of the anesthesia. Anesthesia is induced with nembutal 5 per cent (250 to 500 mgm.) and a mixture of dolantine 100 mgm. and largactil 50 mgm. in 20 ml. of normal saline solution given intravenously. Patients sleep until the following day.

Endotracheal intubation is done by means of succinylcholine and the largest tube possible is used. When spontaneous respirations begin, a bilateral paracentesis is necessary in order to equalize pressure on either side of the tympanic membranes, since the unconscious one is unable to swallow. The patient is then placed on a stretcher and the respiratory circuit is connected to the endotracheal tube.

The physician then takes over, after the preparation of a large number of lines from the cage to various pieces of apparatus in the radiologist's cabin, serving to control electrocardiography, to record respirations, even to announce unforeseen spasms. The radiologist cautiously places small rubber cushions around the patient and secures the sheet of protective lead; then the stretcher is shifted into the cage, and after a careful last inspection of all apparatus and lines, the procedure begins.

Oxygen escapes for a few minutes through the open cage door, to remove the nitrogen inside. The door is closed, and pressure is slowly elevated to 1, 1.5, up to 2 and 2.5 atmospheres. When, after 15 minutes, the manometer indicates 3 atmospheres, the oxygen supply is discontinued, and the radiologist activates the x-ray generator.

Everybody leaves the room to watch, through a window, a living patient in a sombre cage in a solitary room, living, as evidenced by reassuring tracings on the electrocardiograph and the respirometer showing uninterrupted respirations through the endotracheal tube. Anesthesia has passed the point of most profound toxicity and, in addition, is giving some kind of protection. The possibility of cardiac arrest is declared to be unlikely; there was none during the treatment of 120 patients in the London hospital.

A disagreeable incident may occur when, following a too light anesthesia, the patient becomes agitated and thrashes about during treatment. In these cases, rapid decompression is necessary before starting anew. —*Max L. Smith, M.D.*

Intraskeletal Anesthesia During Operations on the Extremities (L'anesthésie intra-osseuse dans les interventions chirurgicales sur les membres). NGUYÊN-TRINH-CO and VU-DUY-THANH. *Anesthésie*, Par., 1957, 14: 1052.

INTRASKELETAL ANESTHESIA during operations on the extremities was first performed by Blinov around 1947. The authors became familiar with the procedure during a visit to Moscow. The technique of intraskeletal anesthesia is based on the following experimental observations. When a tourniquet is placed on the proximal portion of an extremity and methylene blue is injected into the marrow of the long bone of the extremity, sections of the extremity show that the injected media fills all of the vessels of the skin, of the subcutaneous tissues, of the nerves, the muscles as well as the vessels of the periosteum, the bone, and the bone marrow. Therefore, in relation to anesthesia, one can say that the intraskeletal injection of procaine leads to permeation of all of the vessels of all of the tissues of the extremity. Following removal of the tourniquet, the injected substance leaves the extremity via the vascular bed.

In clinical practice the following technique is used: A tourniquet is placed on the extremity in such a manner as to be out of the operative field. The preferred sites for the injection of procaine are the epiphyses of the long bones of the extremities and the bony pro-

tuberances located immediately under the skin. The os calcis, the lateral and medial malleoli, the tibial tuberosity, the femoral condyles on the lower extremity, and the styloid process of the radius and the olecranon for the upper extremity are often used. The authors use a trocar, which is 6 cm. in length and 1 mm. in diameter with a short bevel, to inject the procaine. Following induction of anesthesia of the skin and of the subcutaneous tissues the trocar is guided through the cortex and into the marrow. The anesthetic solution is then injected slowly. For operations on the hand and the wrist, 60 c.c. of a 0.5 solution of procaine are used. For operations on the lower extremities, amounts of from 120 to 150 c.c. may be necessary. This technique was used 154 times by the authors with only 12 cases of failure in which insufficient anesthesia was obtained. The duration of anesthesia obtained by this method appears to be from 1 to 2 hours. In none of the 154 cases were there any complications due to the technique. The major drawback of the method is the necessity of leaving a tourniquet for a prolonged period of time on a patient who is awake.

—*R. Menguy, M.D.*

Halothane, Fluothane; Review and Case Reports (Le halothane, fluothane; etude générale et essais personnels). H. Reinhold, M. de Rood, J. Casaer, and R. Hasaerts. *Acta anaesth. belg.*, 1957, 8: 75.

The use of organic fluorine compounds (long used in refrigerators and as insecticides) for anesthetic purposes was announced in 1932 by Booth and Buxby, and in 1946 Robbins studied 46 fluorinized aliphatic hydrocarbons. Those with a low boiling point produced spasms; the efficacy of anesthesia is increased with the boiling point. Animal research demonstrated results equal to those of chloroform or ether. Generally, the substitution of a chlorine atom by fluorine in a hydrocarbon or ether halogen diminishes the toxicity and the anesthesia power, but the introduction of a second halogen (chlorine, bromide, iodine) results in a considerable increase of anesthetic power; however, studies revealed undesirable hypotension resulting from fluorinized hydrocarbons, and the research work was discontinued. Lu and his associates resumed studies of 24 fluorine substances in 1953, and recommended the fluorinization of ethyl-vinyl ether because of the resulting diminution of inflammability. Halothane is declared to be noninflammable.

Animal research showed a concentration of 2 to 4 per cent to produce surgical anesthesia within 5 minutes and a concentration of 1 per cent to be sufficient for maintenance. Studies on human patients showed a concentration of 0.5 per cent to produce torpor and light analgesia. A concentration of 1 per cent produces unconsciousness after 2 minutes, painful stimuli no longer being felt, with maintenance of respiration. Inhalation of a concentration of 1.5 per cent is tolerated perfectly well without suffocation. For surgical anesthesia, a concentration of 2 to 3 per cent is recommended. Awakening is quick, within 10 to 20 minutes, even after administration of the agent for a period of 5 to 6 hours.

Respiratory distress, found to occur in dogs at the end of 25 minutes of inhalation of a concentration of 4 per cent (3 per cent does not produce apnea), can easily be controlled by artificial respiration. Tachypnea can be controlled by the intravenous injection of dolosal or nisentil. Johnstone, in a prolonged cardiographic study of 500 cases in 1956, reported a low incidence of arrhythmia; other workers have reported a much higher incidence. These arrhythmias can sometimes, but not always, be controlled by atropine, and sometimes they disappear after easing off the anesthesia. The risk of cardiac accident exists only with intravenous administration; intramuscular or subcutaneous injection produces no unfavorable results. Hypotension is easily controlled by intravenous methomaxine or atropine. The ganglioplegic action of halothane is reported to be inconsequential. Microscopic examinations of the liver after prolonged administration of halothane in animals revealed minor changes, but no degeneration. The use of halothane does not produce any disturbance of renal function.

At the conclusion of a rather detailed article covering 25 pages, halothane is stated to occupy a place between trichlorethylene and cyclopropane, and to be a good anesthetic to be used with prudence, permitting perhaps the surgeon to light a cigarette, but certainly not allowing the anesthetist to smoke.

—*Max L. Smith, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Interstitial Pulmonary Edema and Its Radiological Diagnosis; A Sign of Pulmonary Venous and Capillary Hypertension. R. G. GRAINGER. *Brit. J. Radiol.*, 1958, 31: 201.

JUST as edema of the ankles indicates increased systemic venous pressure resulting from embarrassment of the right side of the heart, so may pulmonary edema be used as an indication of a high pulmonary and capillary pressure and embarrassment of the right side of the heart. Pulmonary edema fluid may lie either in the alveolar air spaces or in the connective tissue framework which supports and permeates the human lung. The former variety which may be called alveolar pulmonary edema presents no real problem of diagnosis. Its diagnosis is clinical and usually patently evident. The second variety, interstitial pulmonary edema, does not lend itself to clinical diagnosis and is essentially a radiologic diagnosis.

The extra-alveolar pattern is far more common than the intra-alveolar variety, either of generalized distribution or of the so-called bat's wing pattern. The essential radiologic sign indicating interstitial pulmonary edema is the occurrence of dense, sharp, fine lines first described by Kerley in 1951 as B-lines (the peripheral, horizontal, basal lines) and as A-lines (the less frequent, longer central lines radiating towards the hilum). These lines are due to thickening of interlobular septa, usually of composite septal plates, and usually caused by extra-alveolar edema. Other less frequent causes of increased prominence of these septal lines are pigment deposition, such as is seen in hemosiderosis, malignant cell invasion, fibrous tissue, or venous engorgement. In order to produce the contrast necessary to give this characteristic linear roentgenographic appearance, the edematous radiopaque septa must be surrounded by aerated lung. This interstitial localization of pulmonary edema fluid is particularly well seen in chronic pulmonary venous congestion, as in mitral disease. In pulmonary edema of acute onset, the alveolar spaces become waterlogged because of free permeability of the alveolar wall, and a blotchy, locudy pattern results. The appearance of the lines in chronic pulmonary edema is characteristic. Peripherally, the B-lines may extend right up to the lung apex and along the diaphragmatic surface. All these peripheral lines are predominantly perpendicular to the pleural surface. The lines are usually best seen at the costophrenic angles. The central A-lines are less frequently seen; they are longer, run obliquely towards the hilum, and are frequently curved or sharply angulated. The presence of visible septal lines presents the radiologist with a definitive radiologic diagnosis. This is important because it indicates what may be the first objective evidence of a failure of the right side of the heart, which may not be apparent clinically. —*Sheldon Oscar Burman, M.D.*

Observations on Gastric Parietography (Osservazioni in tema di parietografia gastrica). E. PORTA, M. CORTESE, and E. JANNELLI. *Rass. internaz. clin. ter.*, 1958, 38: 105.

THE TECHNIQUE adopted by the authors for gastric parietography consists in insufflation of approximately 1,500 c.c. of oxygen into the peritoneal cavity by abdominal puncture in the left lower quadrant. Two hours later the patient ingests a solution of 10 per cent tartaric acid, followed by 10 per cent solution of sodium bicarbonate, in amount adapted to the need of the individual case. The patient is then placed flat on his back and the stratigraphic exposures made obliquely so that the shadow of the stomach lies roughly parallel with the surface of the examination table.

The gastric walls are clearly depicted as a narrow bandlike shadow varying in thickness from 5 to 10 mm., compressed by the surrounding organs in accordance with the degree of distention. In the normal organ the free distensibility and mobility of the walls of the stomach are demonstrable.

Six cases with roentgenograms and stratigraphic reproductions are reported. The first 4 were patients with gastric blastoma. One underwent gastric resection and was found to have an adenocarcinoma involving the greater curvature with adhesions to the transverse mesocolon. In the remaining 2 patients gastric tumor was excluded and the abnormal findings were ascribed to perigastric imflammatory processes.

In general, gastric parietography was found to be superior to the usual x-ray examination with a barium meal, particularly with regard to the antral region of the stomach where the anatomical relationships tend to obscure the roentgenographic findings.

The method is especially valuable in the initial stages of gastric neoplasm, in that the presence or absence of mural infiltrative processes can be demonstrated with certainty, and extension to neighboring organs clearly shown. Frequently the method may demonstrate that the process is more extensive than at first suspected and evidence of involvement of neighboring organs may contraindicate a radical surgical procedure or on the other hand indicate a very extensive resection of the stomach, the involved structures, and regional lymph nodes.

The method is not intended to replace the usual roentgenographic examination with a barium meal, but rather to supplement it with a new method of definite prognostic and therapeutic value.

—*John W. Brennan, M.D.*

Study of Colon by Use of High-Kilovoltage Spot-Compression Technique. STEVEN J. FIGIEL, LEO S. FIGIEL, and DESMOND K. RUSH. *J. Am. M. Ass.*, 1958, 166: 1269.

THE AUTHORS review the various methods for examination of the colon, and refer particularly to the double contrast enemas, which have generally been

found to be unsatisfactory. It is their opinion that the high-kilovoltage films, with particular reference to good positioning of the patient, give the highest yield of polypoid lesions of the colon. They have been able to demonstrate lesions as small as 2 mm. in diameter with this technique. This type of technique has become more popular with radiologists in recent years.

In discussing the management of small polypoid lesions, they discuss the work of Arminski and McLean, who analyzed nearly 700 consecutive polyps, and found the incidence of malignancy in polyps less than 5 mm. in diameter was less than 0.2 per cent. There is further evidence that the older age group has a high incidence of these small polyps, which are found at autopsy. Because of the frequency of these polyps, and their low incidence of malignancy, it is suggested that immediate surgical intervention is not always warranted. It is suggested also, that the smaller lesions should be followed at 6 month intervals with repeat barium enema examinations, and excised only if a change is noted. For the past 18 months, they have been observing patients in this manner. Time alone will evaluate the procedure.

—Frank R. Hendrickson, M.D.

Peridural Injection of Contrast Material During an Aortographic Examination (Peridurale Kontrastmittelinjektion bei der Aortographie). E. HAUSCHILD. *Fortsch. Roentgenstrahl.*, 1958, 88: 154.

THE PATIENT was a 59 year old male with a convex scoliosis on the left side of the lower dorsal and upper lumbar vertebrae. Because of unexplained hematuria an attempt was made at subdiaphragmatic aortography. Puncture of the aorta proved difficult but since blood flowed from the needle it was assumed that the aorta had been entered and the injection of triopac 400 was started without waiting to verify the presence of a rhythmic pulsatory movement of the needle.

The patient immediately complained of pain in the sacral region and in both lower extremities; the pain disappeared after an injection of dolantin. The roentgenograms disclosed opacification of the peridural space. The needle had penetrated the intervertebral space between the first and second lumbar vertebrae.

Fifteen minutes later the puncture was repeated and this time was successful. Two hours after the faulty injection clonic spasms of the muscles developed predominantly in the left thigh and leg. These appeared at shorter and shorter intervals until they occurred only a few seconds apart. The patient burst out in sweat and his pulse and respiration became accelerated but his sufferings were relieved by an intravenous injection of evipan (0.4 gm.).

The drowsy patient was given a lytic cocktail (100 mgm. of dolantin, 50 mgm. of atosil, and 50 mgm. of megaphen) and curarin (0.8 ml.) in the so-called depot form.

During the following 3 to 4 hours there were observed at long intervals 5 to 15 minute attacks of spasms of the lower extremities. That night the sleep of the patient was undisturbed. The next morning the patient was still unable to urinate spontaneously and complained of mild pains in the sacral region and weakness in the legs. These disturbances were ascribed to the curarin. There were no evidences of nerve damage and the subsequent course was uneventful. There has been no permanent damage.

Irritative manifestations, pains, and spasms have been mentioned occasionally by other workers after peridurographic examinations, but they have followed use of the weaker concentrations of the contrast material. The severity of the symptoms in this case points to a different etiologic mechanism and resulted from the higher concentration of the preparation which is used for aortography. This seems to be the first report of an accident occurring under the particular circumstances here reported.

—John W. Brennan, M.D.

Complications of Aortography; Factors Influencing Renal Function Following Aortography with 70 Per Cent Urokon. ARTHUR C. BEALL, E. STANLEY CRAWFORD, CECIL M. COUVES, MICHAEL E. DEBAKEY, and JOHN H. MOYER. *Surgery*, 1958, 43: 364.

THE RELATIVE SAFETY of aortography is evident by the many reported applications without incident and the general extent to which it is now being applied. A review of the literature appears to confirm the low incidence of complications; however, the procedure is not entirely harmless and certain difficulties may result from its use. The most common significant complication of aortography is renal damage.

The authors experimentally injected both the renal arteries and the aorta of dogs, with and without compression of the distal portion of the aorta. They then performed elaborate kidney blood flow and filtration studies, at intervals varying from several hours to several days. In addition, they made these same studies on patients who had undergone aortography for clinical reasons.

Both the clinical and laboratory observations indicated that the immediate renal hydrodynamic response to urokon (70 per cent) is vasoconstriction. This was manifested by depression of both the glomerular filtration rate and the renal blood flow. In the dog it was only slightly more pronounced when the aorta was occluded below the renal arteries during the injection. In the human heart, chronic occlusion below the renal arteries due to arteriosclerosis does not appear to predispose the patient to renal damage following the intra-aortic injection. The experimental observations tend to confirm the impression that renal damage results from excessive dosage of contrast media. Excessively large doses of organic iodides were given in all recorded instances of bilateral renal damage. Unilateral renal injury resulted from direct renal artery injection. No renal damage was observed in 200 patients who received less than 25 c.c. of 70 per cent urokon, unless the renal artery was injected directly. *—Frank R. Hendrickson, M.D.*

Gonadal Dose from Mass Miniature Chest X-Rays. H. E. JOHNS and J. C. WILSON. *Canad. M. Ass. J.*, 1958, 78: 571.

IN THE LAST FEW YEARS, many radiologists, biologists, and physicists have become concerned over the genetic hazard of nuclear and allied radiation. In judging the genetic hazard of radiation, one must keep in mind the natural radiation background produced

by cosmic rays, gamma rays from the earth, and internal radioactivity which is present at all times.

Using a wax phantom, the authors made studies of several miniature chest units, and found that when the machine was properly columnated, so that none of the primary irradiation reached the abdomen, the gonadal dose was well within tolerable limits. It should be noted that Osborn and Smith found that 7 per cent of the x-ray examinations, which include those of the hip and lumbar spine, contributed about three-fourths of the total genetically significant dose.

As a result of the survey, it is recommended that secular cones be replaced with rectangular cones to offer a sharper cut-off at the lower margin of the beam. Additional recommendations were that the beam should not extend below the fluoroscopic screen, and that positioning of the patient should be such that the iliac crest is as far below the screen edge as possible.

A comparison of mirror versus lens cameras was performed, which suggested that the mirror type of optical system will permit a reduction of dosage to the patient by a factor of 4 or 5, and is, therefore, the recommended type of apparatus. When these suggestions are followed, the gonadal dose of radiation is reduced to 0.26 mr., or 0.25 per cent of the background irradiation. —*Frank R. Hendrickson, M.D.*

The Present Position of Roentgen Therapy for Inflammatory Disease (Der gegenwaertige Stand der Roentgentherapie entzuendlicher Erkrankungen). G. Fuchs. *Medizinische*, 1958, p. 429.

Since the introduction of roentgen therapy for inflammatory disease by Heidenhain and Fried, an extensive experience by various workers has been accumulated. It has been found that the use of weak irradiation, in doses ranging from one-fiftieth to one-hundredth of that used for malignant tumors, in some way has a beneficial and curative effect upon inflamed tissues. The radiation is never strong enough to act as a bactericidal, or even bacteriostatic agent. The rationale of radiation therapy in inflammatory conditions is based on the following: (1) the rapid increase in antibiotic-resistant bacteria; (2) the failure of chemotherapeutic agents to penetrate abscess cavities; (3) the synergistic action of antibiotics and irradiation; and (4) the efficacy of roentgen therapy in nonbacterial conditions.

Furuncles and carbuncles are lesions which respond very well to irradiation, especially when located around the nose or upper lip. The treatment of choice consists of a dose of x-rays from 30 to 50 roentgens within 24 hours after the first appearance of the lesion. If the lesion is treated in its more advanced stages, therapy is best given in smaller and weaker doses over a longer period of time. Beneficial results are obvious in both instances. In treating sweat gland abscesses of the axilla (hidroadenitis axillaris), higher doses are required in order to achieve satisfactory results and eliminate recurrences. The use of 500 to 600 roentgens to the axilla for four to six treatments is recommended. Epilation may occur and moderate atrophy of the skin may be evident. Chronic inflammatory diseases of the skin such as chronic eczema also respond well to radiation therapy. Very soft x-rays in doses of 50 to 100 roentgens per sitting may be required. The skin is often very sensitive to the irradiation in these situations.

Paronychias and felons are treated as furuncles are. If the underlying bone is involved, more prolonged therapy is required. In all instances of radiation therapy for suppurative processes, incision, drainage, and curettement are carried out as indicated. The alternating use of ultra-violet irradiation and roentgen therapy has also been found beneficial.

Mastitis, especially of puerperal origin, also responds well to from 30 to 50 roentgens if treated early. No restriction of lactation is encountered with therapy of this magnitude.

Pneumonia is another condition which may respond to x-ray therapy, especially the postoperative variety. After one or two treatments of 100 roentgens, one may see a regression of the infiltrate. Unresolved pneumonias may also be treated in this manner with similar results. Interstitial pneumonias of infancy which do not respond to antibiotics may prove to be lethal if not controlled. Twenty-five to 50 roentgens are often sufficient in these conditions.

Radiation therapy of chronic recurrent thrombophlebitis is not used as often as it should be. Dosage ranges from 25 to 50 roentgens per field. Symptoms can usually be controlled within a few days and recurrences are decreased.

The treatment of various arthritic and periarthritic inflammatory processes by radiation is extremely beneficial, although, unfortunately, not curative. Nonetheless, the regression of symptoms is accompanied by objective evidence of a decreased activity of the disease. Doses ranging from 600 to 900 roentgens may be administered through three portals. An alternative method involves doses ranging from 50 to 60 roentgens repeated over four to six treatments. The value of radiation therapy is increased when combined with ultra-violet radiation and short wave therapy. —*J. C. Rosenberg, M.D.*

MISCELLANEOUS

Injuries from Ionizing Rays and Their Prevention (Schaeden durch ionisierende Strahlen und ihre Verhuetung). G. Fuchs. *Wien. med. Wschr.*, 1958, 108: 269.

The use of ionizing rays in medicine, industry, and daily life has increased steadily since their discovery some 6 decades ago. More recently radiation protection has assumed increasing importance, because of descriptions of the atom bomb survivors, the injuries and deaths due to radioactive substances used in industries, and the publicized dangers involved in x-ray examinations and radiation therapy. The most frequently used source of radiation employed in industry is the isotope. Only a small amount of naturally radioactive substances is available, and elements such as radium, thorium, and actinium, can be obtained only by complex and laborious methods from certain ores. Only in nuclear reactor processes can isotopes be produced in adequate amount for industrial uses. The radiation in the cosmic rays, minerals, and radon of the atmosphere may be absorbed by the human body, a living organism on the earth's surface being exposed to an annual dose of 150 to 300 milliroentgen units. In the process of phylogen-

esis sufficient adjustment to this dose is developed. Large doses of ionizing rays may result in irreparable damage, and radiation injuries have been studied in an enormous number—in clinical observations, animal experiments, and as results of atomic warfare, and reports have been published by experts.

The well known results of the atom bomb casualties from uranium and plutonium at Hiroshima and Nagasaki are reviewed, as well as the fatalities and sequelae of nuclear bomb explosions in World War II at Bikini. Since the development of nuclear weapons the possibility of a carcinogenic effect of ionizing rays has received attention, although tumors due to radiation effects had been observed long before ionizing radiation was known, not only in miners inhaling radioactive mineral dust but in patients receiving treatment with x-rays and radium, and more recently in individuals with malignant tumors known as thorotrast sarcoma developing long after the administration of thorium X for diagnostic purposes.

From the mortality statistics of roentgenologists and the subsequent fate of atom bomb victims of Japan, it appears likely that also leukemia can be produced by ionizing rays. Ionized radiation may also produce mutations by their action on the germ plasma. Whereas all other radiation effects concern only the immediately involved individual, the genetic effects have transformed radiation protection to a social problem. The study of the effects of natural radiation have now to be supplemented with a meticulous study of the effects of artificial radiation. The radiating isotopes produced with each explosion of an atomic bomb or hydrogen bomb may remain in the stratosphere for years as a fine dust, and by sedimentation in the humus become food for plants and thus for animals. In particular, strontium 90 in the milk of cows feeding on such plants will thus gain access to the human body, where it is deposited in the skeleton and may remain active for years, with danger of leukemia and malignant tumor formation. If stored in the bones of the pelvis it may give rise to defects in the offspring. There is no uniform distribution of strontium, and all attempts to determine the amount absorbed have failed. Also the amount stored will depend upon the age of the individual. It is concluded that continuation of atom explosions is playing with fire that may have unreckonable consequences to man. An appeal has been made to all physicians to prevent further explosions of atom and hydrogen bombs, and to make sure that atomic energy be used only for peaceful and constructive purposes that will be of benefit to all mankind.

As concerns the use of x-rays for diagnostic and therapeutic purposes, it has been established that roentgen diagnosis is harmless to all except pregnant women, particularly in the early months of pregnancy. Some risk is attached also to irrigoscopy, tomography of the lumbar spine, and other more complicated roentgen examinations requiring considerably larger doses. With rational and proper indications and dosage there should be no special danger to the fetus. Treatment with ionizing rays, however, is never devoid of danger. The roentgen therapist must weigh the risk of injury with the risk of the condition involved. Careful protection of the sex glands is indicated for all patients still in the reproductive age, as well as for children and young persons. X-ray therapy to the ovaries is permissible only for castration, sterility, or mammary carcinoma. Precautions are mandatory for all persons engaged industrially with ionizing rays. The International Radiation Protection Commission has published provisions and laws determining the maximum permissible exposure per week. Recently several expert committees have reduced the permissible exposure to one-third of that hitherto permitted. Adequate observation and control of these rules must be emphasized. There is no doubt that protection against radiation is a serious problem and will more and more occupy the attention of prophylactic and social medicine. Undue anxiety must be avoided as well as unjustifiable parallels between the effects of the atom bombs and the effects of carefully dosed medical radiology to obtain the best results with a minimum of danger. It must be kept in mind that radiation may cure patients who could be helped in no other way.

—*Edith Schanche Moore.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

The Anticellular Effect of Combining Antimitotic Agents (Ricerche sperimentali sull'effetto anticellulare di alcune associazioni di antimitotici su elementi proliferanti in vitro). G. LENTI, E. TORTAROLO, G. MUSOLINO, and F. GIRARDI. *Tumori*, Milano, 1957, 43: 698.

THE AUTHORS have been studying the effect of cytostatic agents upon embryonal proliferations in vitro at the University of Turin. They are reporting upon the value of combining two agents at one time. The combinations studied were chloramine and hydrocortisone, deacetylcolchicine and hydrocortisone, 6-mercaptopurine and chloramine, 6-mercaptopurine and hydrocortisone. The effective dose of each drug was always markedly smaller than the minimal active dose found to be effective in previous experiments.

They have demonstrated the possibility of potentiating the anticellular action by combining drugs. The type and intensity of action varies with the different combinations. The authors discuss the possibility of using a combination of anticellular agents in the treatment of neoplasms. —*Lucian J. Fronduti, M.D.*

The Problem of Embolism of Tumor Cells; Tumor Metastasis in a Cavernoma of the Liver (Zum Problem der Geschwulstzellenembolie; Tumormetastase in einem Leberkavernom). ILSE PECKHOLZ. *Arch. Geschwulstforsch.*, 1958, 12: 201.

THE POSTMORTEM EXAMINATION of a man, aged 54, in whom 15 months prior to his death an inoperable cancer of the lungs had been diagnosed, showed a bronchial tumor in the lower lobe of the left lung. There was lymphangial carcinosis of the left lung and pleura, with involvement of the pericardium, and metastases in the lymph nodes were present in the chest, neck, axillae, and abdomen. Liver metastases were also found.

The histologic study showed a solid, macrocellular carcinoma of the left lung, tumor cells in branches of the portal vein, and a metastasis within a cavernoma of the liver. There were no signs of organization of the tumor emboli in the portal system. On the other hand, foci of organization of tumor masses mixed with fibrin were detected in the cavities of the cavernoma. It seems that fibrin, which surrounds tumor cell emboli, is able to inhibit dissemination of malignant cells at least temporarily.

—*Joseph K. Narat, M.D.*

Malignant Melanoma; Clinical and Pathological Behavior in 127 Cases. J. L. PONKA, D. M. EVANS, and J. H. WYLIE. *J. Michigan M. Soc.*, 1958, 57: 563.

THE AUTHORS reviewed 127 cases of malignant melanoma accumulated over a 25 year period at the Henry Ford Hospital. The classification of nevi by Allen and Spitz is presented and discussed along with the concept that intradermal nevi do not undergo malignant change. Junctional and compound nevi can become malignant. The authors re-emphasize the highly fatal nature of malignant melanoma and express concern regarding this fact since these lesions occur in areas where they can be seen early.

Seventy-one patients (56 per cent) sought advice of a doctor because of a "mole." Various terms were used to describe the condition, such as red spot, cyst, ulcer, blister, or birth mark. In 54 per cent of the cases, a history of bleeding, growth, repeated injury, and color change was noted. The skin proved to be the site most frequently involved (101 cases), an area which is readily visible and therefore theoretically should permit one to make an early diagnosis and thus to institute early treatment. Of 4 patients whose lesions occurred in mucous membranes (oronasal, rectal, and esophagus), all were dead within a year. Initial treatment was carried out by a variety of methods. The authors state the reasons for this as being: (1) lack of appreciation of the nature of the local lesion and (2) uncertainty as to what constitutes good local treatment.

In evaluating the effectiveness of initial local treatment frequency of local recurrence was used. In this series, failure to control the primary lesion occurred in 53 cases (42 per cent). Inadequate local excision, cautery (silver nitrate and nitric acid), irradiation (x-ray, radium), the application of ointments, freezing, aspiration and injection treatment all contributed to a poor result. A study of metastases showed lymph nodes of the inguinal, cervical, and axillary nodal areas to be most frequently involved.

In analyzing the final results of this series, only those patients who were alive 5 years or longer and presumably free of disease were included in the figure of 13 per cent. Of these patients, one-half had some form of local excision and few had early radical procedures. The authors conclude, in order to improve the survival rate of malignant melanoma, that:

1. Patients as well as members of the medical profession should be aware of the seriousness of such changes as growth, bleeding ulcerations, and color changes in pigmented skin lesions.
2. Treatment by x-ray, cautery, freezing, injection, and ointment is condemned.
3. Excisional biopsy, wide resection of the initial lesion, and microscopic examinations should be done.
4. Radical surgery should be carried out earlier to include the regional lymph nodes.

—*John J. Hudock, M.D.*

Relationship Between Hodgkin's Disease and Sarcoma (Beziehungen zwischen Morbus Hodgkin und Sarkom). E. KELLNER. *Arch. Geschwulstforsch.*, 1958, 12: 179.

HISTOLOGIC STUDIES of 32 cases of Hodgkin's disease, supplemented by macroscopic-anatomic examinations and a review of the clinical pictures led the author to the following conclusions.

In 23 cases the classical, granulomatous type was

found. Two forms could be distinguished: (a) the acute type, with miliary dissemination in the spleen and liver, and numerous giant cells around the foci, and (b) the chronic, nodular type, with circumscribed areas, enclosed in a capsule, and surrounded by a margin of eosinophile cells.

In 9 cases lymphocytes and eosinophile cells did not dominate the picture, while giant cells and mononuclear, reticular cells and those resembling fibroplastic formation were numerous and present also in the margins and in the vicinity of the foci. In other words, a sarcomatous picture was present. In 6 cases belonging to this group an accumulation of eosinophile cells was found in the marginal area, so that an intermediate form, or Hodgkin's sarcoma, was produced.

The existence of transitional forms between the miliary and nodular groups, and also between granulomatous and sarcomatous formations suggests that Hodgkin's disease may be considered a primary sarcoma. On the other hand, granulomatous formations of the nodular type, with encapsulated foci, may last many decades and show spontaneous remissions. Such conditions justify the assumption that Hodgkin's disease represents a special type of chronic inflammation which from the very beginning is closely related to sarcoma and which eventually may become transformed into such a tumor.

—*Joseph K. Narat, M.D.*

DUCTLESS GLANDS

The Changing Pattern of Thyroid Disease. THOMAS J. MUDGE, THOMAS SELLETT, and RAYMOND W. NEMECEK. *Surgery*, 1958, 43: 622.

THIS ARTICLE represents a study of thyroid disease made over a 20 year period, 1935 to 1954. During this time 4,542 operations were performed. The results are tabulated and the tables are easily interpreted. The entities studied were: nontoxic nodular goiter, toxic nodular goiter, nontoxic diffuse goiter, toxic diffuse goiter, thyroiditis, adenomas, and malignant lesions. There was a definite increase in the number of nontoxic nodular goiters throughout the years, and a decrease in toxic nodular goiters. The authors suggest that during periods of economic depression there are fewer operations done for the nontoxic lesions, and that later in the study, when prosperity reigned, more patients presented themselves for surgery. He also suggested cancer consciousness as being a motivating factor in the later years of the study. No trend was noted in nontoxic diffuse goiters, except that they are at times diagnosed as nodular tumors.

A slow decline in the number of cases of toxic diffuse goiter was noted. Iodine intake is suggested as a factor. Some of these patients who were formerly treated surgically are now treated medically. Four patients with subacute thyroiditis were encountered; they responded to cortisone administration. The remaining 127 cases were classified as chronic thyroiditis, and nearly all were found in women. The tabulation showed a definite increase in the cases of chronic thyroiditis.

Adenomas were excluded from cancers on the basis of encapsulation, homogenous structure, and variation from the adjacent thyroid beyond the capsule. The predominant lesions were those of papillary and follicular cellular arrangement. There was an overwhelming number of follicular type versus papillary variety.

Malignant tumors comprised 147 specimens. They were found in larger numbers in solitary nodules; few were found in toxic or diffuse goiters. It was concluded that the relationship of cancer to nontoxic nodular glands has remained the same. Patients with local recurrences often survive to have another, whereas those with more anaplastic tumors succumb to distant metastases or rapid local invasion.

—*Richard L. Lawton, M.D.*

Tumors of the Thyroid. GRANT E. WARD. *Am. J. Surg.*, 1958, 95: 385.

THIS IS A study of a variety of tumefactions in the region of the thyroid gland. These are classified as conditions resembling tumors, and benign and malignant tumors of the thyroid gland. The first category includes thyroglossal duct cysts, adenomatous colloid goiter, and various forms of thyroiditis. The benign tumors are classified as follicular adenomas, and papillary adenomas. The natural history of each is presented and the precancerous possibilities are discussed. Of the malignant tumors there are roughly three: follicular carcinomas, papillary carcinomas, and the undifferentiated carcinomas of the thyroid gland.

The anatomy of the gland is discussed, particularly of the lingual thyroid, as well as venous and lymphatic drainage. It is stressed that if a lingual thyroid is present there may be no lateral components. Also, venous ligation prior to surgical manipulation of the cancerous gland is recommended.

The treatment of thyroid tumors has evolved around the importance of the solitary nodule. The incidence of carcinoma in solitary nodules varies from place to place and has been reported as high as 24 per cent. The treatment of follicular adenomas advocated is wide local excision. No definite surgical approach is suggested concerning the papillary adenoma. The prognosis of clinically benign solitary nodules is good even though malignant change may be reported therein.

A more radical surgical treatment is advocated for the malignant tumors. This generally takes the form of resection of the lobe and isthmus with ipsilateral radical neck dissection. The work of Asper and Hunter concerning the incidence of thyroid carcinoma in previously irradiated necks is cited.

Papillary carcinoma is the malignant condition most frequently encountered. This is true particularly in younger age groups. Much controversy has arisen concerning the type of therapy to be used. The natural history in this type of tumor is often prolonged, and the first indication of its presence may be a metastasis to the neck (lateral aberrant thyroid). Added impetus is given to the thesis of radical neck dissection by the work of Frazell and Foote who found positive nodes in 61 per cent of a group of clinically negative necks.

The author lists Crile's fourteen reasons for not doing radical neck surgery, and comments on them. In the author's series there was an 85 per cent 5 year, 72 per cent 10 year, and a 66 per cent 15 year survival for papillary carcinoma. Follicular carcinoma showed

an 82 per cent 5 year and a 60 per cent 10 year survival; there were no 15 year survivals.

Undifferentiated carcinomas, whether small celled, large celled, or of the Hürthle cell variety, have a poor prognosis. The average duration of life as reported by some authors (Frazell and Foote) was approximately 5 months from the time of diagnosis.

Radioiodine can be successfully used at times. Whether a tumor will pick up the radioactive substance is somewhat unpredictable. The uptake can be encouraged by total surgical thyroidectomy, radioiodine thyroid destruction, or the administration of thyroid-stimulating hormone. Preoperative thyrograms may suggest carcinoma if there is a lack of uptake in a certain region. —*Richard L. Lawton, M.D.*

Papillary Carcinoma of the Thyroid; An Evaluation of Surgical Therapy. CHARLES R. UNDERWOOD, LAUREN V. ACKERMAN, and CHARLES ECKERT. *Surgery*, 1958, 43: 610.

THE AUTHORS studied the cases of 62 patients with papillary carcinoma of the thyroid. Symptomatology and pathology are rather extensively discussed. A variety of operative procedures were utilized in these patients. The controversy of radical versus conservative therapy is again discussed, the authors subscribing to the radical thesis. Several tables of figures are used to illustrate pertinent data. Photomicrographic representation brings out several important points.

The natural history, i.e., good health in the presence of tumor, long survival even with metastases, is mentioned. Multiple foci of origin have been encountered even in the contralateral lobe. Since many of these tumors occur in young girls, the cosmetic aspect of surgery must be considered. In some cases a modified radical neck operation (preserving the sternocleidomastoid) has been advocated.

The 62 cases studied here were taken from the era between 1929 and 1955. The authors' aim is to correlate end results with pathologic findings and treatment.

The tumor was found four times more frequently in women than in men. The presenting symptom was a single nodule of the thyroid in 53 per cent of cases, and cervical lymph node enlargement was the initial symptom in 13 per cent. Simultaneous thyroid nodule and cervical nodule was noted in 26 per cent of cases. If the latter situation obtains in a young person a presumptive diagnosis of thyroid carcinoma can be made. Frozen section is stated to be of definite value.

Papillary tumors may be detected by examining a cut section with a hand lens. This technique is especially fruitful when examining cystic metastases and noting the presence of papillary projections. Pure papillary tumors were found in 64 per cent of specimens. The remainder, or 36 per cent, were the mixed variety with follicular elements being present. The authors believe that the tumors should be classified as papillary if this element is present, regardless of the amount of follicular arrangement noted. The presence of psammoma bodies is suggestive of malignancy. Metastases were found in 42 per cent of cases, but these cases included specimens that contained no lymph nodes. If the latter were excluded the incidence rose to 90 per cent.

In the group studied from 1929 to 1944, 60 per cent are alive without cancer. From 1945 to 1949, 50 per cent are alive with no tumor. In the latest group (1950 to 1955) 86 per cent are free of disease. In this latter group many of the cases were recently acquired.

Operative treatment is discussed as applied to five situations. In case of tumor localized to the thyroid gland, extracapsular lobectomy is advised. It may be extended to the isthmus and opposite lobe, or to the excision of contiguous structures (carotid artery, esophagus, trachea) should they be involved in tumor spread. Solitary nodules are treated by total lobectomy. If a definite diagnosis of papillary carcinoma can be made, a subtotal removal of the opposite lobe is indicated. Should the patient have palpable lymph nodes a standard radical neck operation is advocated. When the diagnosis of papillary cancer is made by excision of a cervical lymph node, a total lobectomy is done on the side of the metastases with contralateral subtotal lobectomy, and en bloc removal of nodes on the primary side. Persistence of disease in the neck may be successfully treated by secondary operation, especially when the tumor is present as lymph node metastases. Nonresectable local tumor and metastatic deposits may be benefited by thyroid hormone. The pain of osseous metastases can be controlled by the use of x-ray therapy. —*Richard L. Lawton, M.D.*

Hypertension in Hyperparathyroidism. JOHN HELLSTRÖM, GUNNAR BIRKE, and C. A. EDVALL. *Brit. J. Urol.*, 1958, 30: 13.

THE AUTHORS found that hypertension is frequently associated with hyperparathyroidism. In this study of 105 cases an attempt is made to correlate the hypertension with a renal lesion. The kidneys were studied by routine biopsy and a number of function tests. The relationship of hypertension to nephrolithiasis, nephrocalcinosis, osteitis fibrosa, and severe urinary infection was studied. The patients were divided into 6 groups which were for the most part related to the degree and onset of the hypertension. The article is illustrated with a number of tables.

Some degree of renal calcification was noted roentgenographically in 84 per cent of the cases. Renal functional impairment was present in nearly all of the cases. About 70 per cent of the patients were hypertensive sometime during the disease. The mortality of the whole group was 20 per cent, and the most common cause of death was renal insufficiency. Among 95 cases, parathyroid adenomas were noted in 85, and primary hyperplasia in 10. Women outnumbered men about 2 to 1.

The renal lesion promptly improved in many cases of successful parathyroidectomy. This suggested a functional lesion and the possibility that the parathyroid hormone might be involved. The degree of renal impairment seemed to be related to the severity of the hypertension, and the renal lesion would seem to precede the hypertension. The finding of parathyroid osteitis is indicative of a particularly severe type of disease. It was associated with severe hypertension. Little relationship was noted between hypertension and urinary infection. The study suggests, but does not prove, that the renal lesion is primary to hypertension.

—*Richard L. Lawton, M.D.*

Tumors of the Parathyroid Glands; Primary Hyperparathyroidism. B. MARDEN BLACK. *Am. J. Surg.*, 1958, 95: 395.

PRIMARY HYPERPARATHYROIDISM, the condition resulting from hyperfunctioning tumors of the parathyroid glands, is a fairly common, potentially fatal disease which is curable in most cases if treatment is instituted before progressive renal disease develops. Neither diagnosis nor treatment is particularly difficult, although diagnosis is rarely made before complications involving the skeleton or urinary tract have developed. The osseous complication, generalized osteitis fibrosa cystica, is somewhat unusual, whereas complications involving the urinary tract, particularly urinary lithiasis, are common. It has been estimated that probably 5 per cent of all cases of radiopaque urinary lithiasis and possibly 15 per cent of cases of recurrent lithiasis result from hyperparathyroidism.

In somewhat more than 80 per cent of cases hyperparathyroidism results from a single adenoma, in less than 10 per cent from multiple adenomas, and in about 10 per cent from primary or wasserhelle hyperplasia. Malignant tumors are, fortunately, rather rare, accounting for not more than 1 to 2 per cent of cases. Hyperparathyroidism is the same regardless of the lesion of the parathyroids.

The fundamental metabolic changes of hyperparathyroidism are increased concentration of calcium and decreased concentration of phosphorus in the serum, and increased excretion of both in the urine. Osseous disease results from the continued loss of calcium and probably from the direct effect of the hormone on bone. Hypercalcemia per se gives rise to lassitude and weakness, loss of appetite, nausea and vomiting, gaseous distention, and constipation. Parathyroid hormone is a potent diuretic and in all cases polyuria and polydipsia are present.

The diagnosis of hyperparathyroidism should be considered in all cases of renal lithiasis in which the stones contain calcium, in cases of polyuria and polydipsia, and in cases of generalized osseous disease. The roentgenologic changes of osteitis fibrosa cystica are so definite that the diagnosis should present few difficulties.

The only known treatment of hyperparathyroidism is the removal of the lesion or lesions of the parathyroid glands. Cervical dissection, which is always carried out first, is done through the usual incision for thyroidectomy. After the four parathyroids have been found, the enlarged gland or glands are removed totally. Before the incision is closed it is most gratifying to have microscopic confirmation that the structure removed is actually a parathyroid adenoma. The author believes strongly that mediastinal dissection should not be carried out at the same time as a fruitless cervical dissection but should be postponed for a month or so.

In the usual case, the values for calcium and phosphorus in blood and urine revert to normal within a day or so after operation. In some cases, however, the concentration of phosphorus may remain depressed for weeks. In the absence of osseous disease, transient tetany occurs in about 50 per cent of cases. Treatment usually is not necessary. If all parathyroid tissue has been destroyed or removed, chronic tetany ensues which must be treated. Other postoperative complications are the same as those that develop after thyroidectomy.

As far as is known hyperparathyroidism resulting from adenomas and wasserhelle hyperplasia does not recur. The treatment of parathyroid carcinoma has proved most disappointing. In practically all cases, the lesion has recurred locally or a functioning metastatic lesion has developed producing a recurrence of the hyperparathyroidism. Death usually has resulted from uncontrollable hyperparathyroidism and its complications rather than from the carcinoma. The skeletal changes are completely reversible, that is, osteitis fibrosa cystica is cured. Gross deformities persist and the internal architecture of bones usually remains somewhat abnormal. The ultimate outlook depends entirely on the status of the kidneys at the time of treatment. Renal impairment, beyond a point as yet undefined, is progressive in spite of cure of the hyperparathyroidism. Death takes place, usually after 10 to 15 years, more commonly from the complications of hypertension rather than from insufficiency of the kidneys.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Parotid Perithelioma (Contributo allo studio dei periteliomi parotidei). N. DEL BELLO and A. CAROTENUTO. *Rass. internaz. clin. ter.*, 1958, 38: 63.

THE AUTHORS report on a personally observed case of parotid perithelioma seen in a 67 year old miner. Four years previously a tumor about the size of an almond was excised from behind the right ear. It had gradually increased in size during a 3 year period. One year after excision the tumor recurred. Following trauma some bright red blood escaped from a break in the continuity of the tumor and the tumor was again removed. Three years after the second excision the patient was first seen by the authors at the surgical clinic of the University of Naples. The recurrent tumor had increased to the size of a large almond. There were no palpable nodes in the immediate region.

The tumor was excised and found to extend deep into the tissues. It was very vascular and bled freely during the removal. The postoperative course was satisfactory and the patient was then given x-ray therapy to the area. The pathologic study revealed the tumor to be a perithelioma.

After reviewing the literature the authors point out that peritheliomas are prone to recur locally unless completely excised. Metastases are not frequent. These tumors are radioresistant. The authors recommend radical total excision of the parotid gland as the preferred treatment for this type of tumor.

—Lucian J. Fronduti, M.D.

A Rare Neoplasm of the Parotid Gland—Rhabdomyosarcoma (Su una rara neoplasia della parotide: il rabdomiosarcoma). L. MISELLI. *Arch. ital. mal. app. diger.*, 1957, 24: 158.

THE AUTHOR of this article reports a case of rhabdomyosarcoma of the parotid gland which came under his personal observation at the Institute of Surgical Pathology, University of Modena Medical School, Modena, Italy.

The patient, a 57 year old white laborer, first noted a swelling of the left parotid region about three years before his admission to the hospital. This swelling was completely painless and reached the size of a cherry over a short period of time. After this initial onset the tumor underwent no noticeable change during the next 3 years. Then 4 months before admission of the patient to the hospital the tumor began to grow again, reaching the size of a golf ball in a few months. This time the patient complained of pain, difficulty in neck movement, loss of appetite, and fatigue. He also noticed a weight loss of about 11 pounds in 3 months.

Physical examination revealed a 57 year old white male in apparently good health. In the left parotid region there was a mass the size of a golf ball, elastic, tender on palpation, and covered by red and edematous skin.

At surgery a mass of 3 by 4.5 cm. in size was found in the parotid loggia with complete displacement of the parotid gland. The tumor was completely encapsulated and there were no adhesions, so that the ablation did not present any particular difficulty.

Pathological examination of the specimen revealed a mass formed by a yellowish-pink hard tissue without necrotic areas, entirely surrounded by a rather thick capsule. Histologically, the tumor was shown to consist of highly cellular tissue with sparsely scattered connective fiber bundles rich in vessels. The tumor cells were widely varied in size and shape. Among large, polyhedric cells with small central nuclei there were several elongated, triangular and quadrangular elements with peripheral nuclei. The cytoplasm was generally poorly stained, not well demarcated, and was either entirely free from granules or contained occasional fine ones. The pathological diagnosis was rhabdomyosarcoma of the parotid gland.

The patient withstood surgery very well and had an uneventful postoperative course. He was adequately treated with postoperative roentgen therapy, but died one year later because of multiple pulmonary metastases. This outcome seems to be the most common result for this particular type of neoplasm.

—Riccardo Benvenuto, M.D.

The Treatment of Parotid Tumors in the Light of a Pathological Study of Parotidectomy Material. DAVID H. PATEY and A. C. THACKRAY. *Brit. J. Surg.*, 1958, 45: 477.

THE AUTHORS present a clinicopathological study of 80 cases of parotid tumors extending over a period of 6 years.

The special methods used in study of the material were: (1) complete serial sectioning of the gland and the contained tumors, (2) histological examination of excised tumor, and (3) cytological examination of the washings from the parotid bed.

The authors showed that the factors responsible for recurrence of mixed tumors, a group which composed

almost 65 per cent of the series, were failure to remove the peripheral nodules and implantation during excision. Multiplicity of foci was not a factor.

Recurrent peripheral nodules developed from local rupture of the tumor material through the capsule followed by fibrosis and consequent localization. Recurrent mixed tumors were, therefore, often multiple and scar implantation was common.

Other types of tumors reveal varying reasons for recurrence; for example, cylindromas and mucoepidermoid tumors characteristically infiltrate.

It was noted that carcinomas were frequently superimposed on an inactive tumor of many years' duration, this type being highly malignant.

Because of the danger of implantation, preoperative and even operative biopsy is dangerous and it is the author's contention that all parotid tumors are either malignant or potentially malignant, and exploration should be carried out early.

The authors state that the best treatment for this disease is some form of conservative parotidectomy made with every effort to preserve the facial nerve. However, in the case of infiltrative tumors total or partial resection should be undertaken, the choice depending on the nature and extent of the process at exploration. —*John R. Lindsay, M.D.*

An Account of a Case of Reticulosarcoma of the Marrow of the Lower Jaw (Consideraciones sobre un caso de reticulo sarcoma de la medula osea del maxilar inferior). RAUL MENA SERRA, GASTON COMAS, and OSVALDO COSTA. *Arch. cuban. cancer.*, 1958, 17: 62.

THE AUTHORS report the case of a malignant osteolytic tumor of the marrow of the left lower jaw showing very rapid growth and extreme sensitiveness to x-ray therapy, which occurred in a 6 year old Cuban child. Microscopic study demonstrated that the tumor was formed by stem or undifferentiated cells similar to the cells seen in reticular lymphosarcoma of the lymph nodes, and in some areas metastatic tumor cells were demonstrated in the blood vessels. It appeared that the tumor must originate in the reticular cells of the marrow, and the authors classified it as a lymphoid reticular lymphosarcoma.

—*W. Foster Montgomery, M.D.*

EYE

Epidermoid and Dermoid Tumors of the Orbit. PATRICK C. CAREY. *Brit. J. Ophth.*, 1958, 42: 225.

THE GENESIS and nature of epidermoid and dermoid tumors is reviewed, and 7 cases, 5 epidermoids and 2 dermoids, are reported. The prevailing opinion is that these tumors originate from cell rests, the dermoid from cell rests containing epithelial and dermal elements and the epidermoid from rests containing squamous epithelium. The diagnosis of these tumors is made from the clinical features and the radiological findings, and can be confirmed histologically.

The author's 7 cases are reported in detail including the clinical features, radiologic changes, operative findings, and histologic examination. All 7 patients were treated surgically, the surgical indications being a disfiguring proptosis and extension of the lesion beyond the confines of the orbit. In 6 cases the bony orbit was involved. In 4 patients the tumor extended into the cranial fossa, in 3 it was adherent to the dura, and in one patient it had extended intradurally.

Of the surgical procedures available, the author prefers an osteoplastic frontal craniotomy combined with removal of the lateral wall of the orbit. This provides adequate access to the tumor in the orbit and its extension into the anterior and middle cranial fossae and gives a good postoperative cosmetic result. He prefers this procedure because the anterior approach does not give adequate access to the surgical field, the Kronlein operation leaves a disfiguring scar, and Jackson's lateral approach does not give access to intracranial extensions.

—*Ray K. Daily, M.D.*

Lamellar Keratoplasty for Herpes Febrilis Ulceration of the Cornea. MICHAEL J. HOGAN. *Am. J. Ophth.*, 1958, 45: 106.

THERAPEUTIC LAMELLAR GRAFTING is indicated in cases of herpes with chronic superficial ulcerations and deep, more extensive ulcerations which fail to respond to treatment within 2 or 3 months, in chronic disciform ulcers which have perforated, and in those cases with frequent recurrences of dendritic ulcerations.

The contraindications to lamellar keratoplasty in these types of cases are secondary infection, glaucoma, and iridocyclitis, although the latter two conditions frequently subside after lamellar keratoplasty. The operative technique and postoperative care are described in detail. The complications are wound separation, glaucoma, and iridocyclitis. Secondary infection, anterior synechiae, and anterior chamber hemorrhages are rare complications. The results obtained by lamellar keratoplasty in 9 cases of chronic herpetic ulceration of the cornea are discussed.

—*J. Jack Stokes, M.D.*

On the Correction of Unilateral Aphakia with Contact Lenses. KENNETH N. OGLE, HERMANN M. BURIAN, and ROBERT E. BANNON. *Arch. Ophth.*, 1958, 59: 639.

GENERAL OPTICAL CONSIDERATIONS show that it may be difficult or impossible to reduce or eliminate the substantial amount of aniseikonia (9 per cent) that remains after unilateral aphakia is corrected by contact lenses. The ametropia that existed prior to the operation and its origin (axial or refractive) play important roles in determining the degree of aniseikonia. The magnification of the retinal image of the aphakic eye when corrected with a contact lens is much greater if the eye was originally axially myopic; it is less if originally the eye was axially hyperopic. The cases of unilateral aphakia in which the unoperated-on eye was axially myopic by about 6 diopters and in which both eyes were corrected by contact lenses present a greater possibility of approximating or equalizing the magnifications of the retinal images in the two eyes. Similarly, those cases in which the eyes were axially hyperopic by at least 5 diopters prior to operation also present a better possibility if the aphakic eye is corrected by a contact lens and the unoperated-on eye, by a spectacle lens.

The general physiologic problem of how the patients who were reported (in the literature) as

being able to wear contact lenses with restoration of binocular vision coped with the residual aniseikonia, as well as what information must be obtained to answer the problem is discussed.

Four selected case reports present the optical principles discussed in this article, with emphasis on the difficulties involved.

Retraction of Scleral Wound Edges As a Fistulizing Procedure for Glaucoma. HAROLD G. SCHEIE. *Am. J. Ophth.*, 1958, 45: 220.

A NEW METHOD for performing a filtration operation for glaucoma is presented. A fistula is produced by causing an *ab extremo* scleral incision to gape by application of the galvanocautery to the wound edges. The wound edges separate from 0.5 to 1.0 mm. Then a peripheral iridectomy is performed to prevent prolapse of the iris or plugging of the wound.

The operation is simple to do, is safe because the eye is not penetrated, is not associated with bleeding, and was successful in a series performed by the author. The bleb is thick walled and flat and less prone to late infection than a trephine bleb. The operation can be done on any meridian of the globe and will not interfere with any subsequent surgery that may be necessary.

It is of most value in narrow-angle, iris block glaucoma but can be used in other types.

—Earl H. Merz, M.D.

EAR

Chronic Otitis Media and Mastoiditis Due to Proteus Vulgaris; Bacillus Proteus. FRANCIS H. MCGOVERN and AFIF A. KHURI. *Arch. Otolar*, Chic., 1958, 67: 403.

THE MANAGEMENT of temporal bone infections due to Proteus vulgaris (bacillus proteus) continues to be a perplexing problem in otology. The success of antibiotic therapy in treating most infections of the ear is often not evident when this organism is involved. In fact the authors' concern with Proteus vulgaris has not materially changed since the report made by McGovern in 1936. This situation is illustrated by 4 cases in which the usually ubiquitous saprophytic Proteus, flourishing in the confined space of a chronic otitis media, extended centrally to produce a fatal intracranial complication.

These cases warrant discussion for a number of reasons. Chronic otitis media is one of the major problems in otology. When Proteus vulgaris is implicated, because of its insidious nature the disease becomes more complex. Also there appears to be an increased incidence of Proteus in routine cultures of all sorts in recent years, perhaps because bacteriologists are paying more attention to the importance of Proteus vulgaris as a pathogen. Further, considerable interest has been taken in the resistance of strains of Proteus to antibiotics, the development of cross resistance, the change in sensitivity of Proteus to antibacterial agents over a course of years, and the possible effectiveness of combined antibiotic therapy against this organism. Finally, we must consider the problem of the emergence of Proteus as a resistant pathogenic organism in a mixed infection after the sensitive flora have been eliminated by routine antibiotic therapy.

From a clinical point of view Proteus vulgaris otitis media and mastoiditis is usually characterized by extensive destruction of the middle ear and mastoid, fetid otorrhea, cholesteatoma formation, granulation and necrotic tissue, pathologic exposure of the lateral sinus and dura, and epidural abscess. Otitic facial palsy is not infrequent.

The onset of intracranial extension—lateral sinus thrombosis, septicemia, meningitis, and brain abscess—is often rapid. Otalgia, headache, stiff neck, vomiting, fever, and convulsions initiate the symptomatology. Early spinal puncture is essential.

The medical and surgical management of cases of chronic otitis media in which Proteus vulgaris has been identified as the causative organism is the same as the accepted treatment of chronic otitis media caused by any other bacteria, with the exception of an added amount of alertness to the treacherous propensities of Proteus. The authors are inclined to regard the main treatment of Proteus infections of the ear, with or without complications, as surgical. The newer concepts of reconstructive surgery of the middle ear will promote earlier and more complete operations for this type of chronic otitis media. In this way the serious complications will be avoided, the functional capacity of the ear will be maintained, and a dry cavity assured. X-ray studies are of paramount importance. Cases of chronic otitis media of the nondangerous type, with a central perforation, are treated conservatively; after the culture and sensitivity tests have been obtained, the drug of choice is used locally and systematically. In the acute case, before the sensitivity tests are reported, chloramphenicol should be the drug of choice. Surgery is advised if a cholesteatoma can be demonstrated; if pain, vertigo, or nausea is a factor; if a fistula sign is evident, or if the progress under conservative management is not promptly satisfactory. The surgery should be meticulous and complete. The postoperative period should be closely observed, and prompt attention should be paid to symptoms and signs of intracranial involvement. *—John J. Ballenger, M.D.*

MOUTH

The Preliminary Osteoplasty of Defects in Infants with Harelip and Cleft Palate (Die primaere Osteoplastik der Defekte des Kieferbogens bei Lippen-Kiefer-Gaumenspalten am Saeugling). J. SCHRUDDE and R. STELLMACH. *Zbl. chir.*, 1958, 83: 849.

THE PRESENT MAIN PROBLEMS of surgery for cleft palate are the absence of the prominence of the premaxilla and the lack of its osseous connections with the lateral maxillae. In cases of a double harelip and cleft palate, the procedure of primary osteoplasty following the method of Axhausen, is used; this method is described in detail. It consists of interposition of rib bone (autotransplant) into the cleft simultaneously with plastic closure of the lip and the floor of the nose. This operation has been performed on 20 patients.

The advantages of this method consist of more favorable conditions for the immediate treatment and for the subsequent functional orthopedic treatment because of adjustment of the stumps of the maxillae

with primary molding of the maxillary arch. Furthermore, an increased stability of the maxillary arch during growth and better mastication are obtained by retaining the teeth belonging to the premaxilla.

—Oscar E. Hallberg, M.D.

End Results in Carcinoma of the Oral Cavity. SAMUEL L. PERZIK, EUGENE J. JOERGENSON, RICHARD P. CARTER, and PAUL H. DEEB. *Arch. Surg.*, 1958, 76: 677.

THE AUTHORS present a statistical analysis of the end results of oral carcinoma treated more than 15 years. This series was divided into three groups according to the area involved: lip, tonsil, and tongue, the latter group including the floor of the mouth.

The over-all cure rate in this series was 11 per cent, the low rate being attributed to the inclusion of 33 per cent of advanced cases, ineligible for either radiation or treatment.

A detailed analysis was carried out on the tongue series, showing that the highest 5 year cure rate of 42 per cent was obtained with a combination of radiation and surgery; this was followed by the radical surgery group with a cure rate of 30 per cent, surgery alone with 20 per cent, and irradiation alone with 15 per cent.

The authors concluded from their studies that surgery and irradiation should be combined in the management of these lesions and because of the fact that 90 per cent of the lesions remain localized above the clavicle, there should be an ever increasing cure rate for this disease. *—John R. Lindsay, M.D.*

NECK

Posterior Mediastinal Goiters (I gozzi intratoracici detti "posteriori"). I. NOVI. *Arch. ital. chir.*, 1958, 83: 177.

THE AUTHOR reviews the literature on posterior mediastinal goiters and points out the great divergence of opinion on the frequency of this tumor in relation to anterior mediastinal goiters. They occur more frequently in females in the fourth and fifth decades of life.

Although called posterior these tumors are in reality situated lateral to the trachea and esophagus and are usually right sided. The consistency of the cervical goiter as it migrates into the thorax will determine whether it will remain in the anterior mediastinum or will assume a viscerolateral position. Furthermore, the author adduces some embryologic and anatomic evidence to stress that some at least of these posterior mediastinal goiters do not migrate from the cervical region but arise from ectopic mediastinal thyroid tissue.

Pathologically the same varied picture which is seen in cervical goiters may be observed in mediastinal goiters. About 5 per cent of thoracic goiters become malignant.

Posterior mediastinal goiters remain asymptomatic longer than anterior tumors and are often first detected on roentgenographic examination. In the differential diagnosis, neurogenic tumors prove particularly confusing. The final diagnosis can usually only be determined at operation. The lateral transpleural approach is preferable in removing these posterior tumors.

The author found one case of posterior mediastinal goiter among 40 thoracic goiters seen at his clinic. This case is described in detail with special emphasis on the fact that no connection with the cervical thyroid gland could be determined.

—Alfred Wiener, M.D.

An Evaluation of Cystic Tumors of the Neck. M. M. COPELAND and C. F. GESCHICKTER. *Am. Surgeon*, 1958, 24: 321.

ALTHOUGH CYSTIC TUMORS of the neck are usually seen in adults, the majority are congenital in origin. Cystic tumors of the neck include epidermoid or sebaceous cysts, branchial cysts, cystic hygromas, thyroglossal duct cysts, papillary cystadenoma lymphomatosum of the parotid salivary gland, and cystic degeneration of lymph nodes involved by tumor or infection.

The differential diagnosis of the various cystic lesions is outlined as well as the histopathology, treatment, and prognosis. Malignant changes have occurred in epidermoid or sebaceous cysts, branchial cleft cysts, and thyroglossal duct cysts.

The authors claim to have observed one case in which a squamous-celled carcinoma was found in the wall of a branchial cyst. The patient remained well 5 years after a radical neck dissection. The authors agree with the general feeling that most so-called branchiogenic cancer represents metastasis to the cervical nodes from silent lesions of the mouth or pharynx. *—Harvey W. Baker, M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Surgical Treatment of Spontaneous Intracranial Hemorrhage. MURRAY A. FALCONER. *Brit. M. J.*, 1958, 1: 790.

THIS EXPERIENCED NEUROSURGEON briefly discusses his reasons for the choice and timing of various procedures following intracranial bleeding from presumed ruptured aneurysm and gives a brief analysis of his results in 50 cases (3 operative deaths, 3 deaths from further bleeding, and 5 "poor" results indicating some degree of permanent neurologic deficit). The mortality in this recent series has been greatly reduced by selecting for angiography and possible intervention only those patients who have survived their bleeding for one week and are in good condition. However, improved surgical statistics do not settle the propriety of earlier intervention in the first week when surgical mortality is higher but spontaneous mortality from recurrent bleeding approaches 50 per cent.

His selection of carotid ligation in the neck as the definitive treatment for certain internal carotid aneurysms which do not appear favorable for direct attack parallels the general thinking in this country. He prefers common carotid ligation as safer, although admittedly less effective theoretically, and has had only one recurrent bleeding in 11 cases. However, there were 2 "poor" results and one operative death which might have been prevented by the clamps generally utilized in America which permit gradual occlusion and immediate opening at the bedside when complications threaten.

In apparently highly satisfactory results in the intracranial approach to aneurysms (biased by selection of late cases) the author believes hypotensive drugs have been useful. He has wrapped hammered muscle or gauze about 29 aneurysmal sacs when the neck of the aneurysm could not be isolated, and only one of these bled subsequently.

The article includes a good bibliography of recent publications on this controversial subject.

—Frank E. Nulsen, M.D.

Neurosurgical Aspects of Occlusive Cerebral Vascular Disease. J. E. WEBSTER, E. S. GURDJIAN, D. W. LINDNER, and W. G. HARDY. *Radiology*, 1958, 70: 825.

THE AUTHOR points out the fact that although "stroke" or "cerebral vascular accident" may well be the result of carotid or other vascular trunk occlusion, it must not be forgotten that such neurologic signs may also be the result of a surgical mass lesion—brain tumor, hematoma, abscess (of which they found 25 in a series of 200 patients studied), embolism, saccular aneurysm, cerebral atrophy, postictal state, lues, encephalitis, and others.

A safe test for cerebral vascular insufficiency when hemiparesis or hemiplegia exists is the use of carotid artery compression in the neck. Upon such compression syncope may occur, which indicates a severe contralateral carotid occlusion, an anterior cerebral artery occlusion, or a basilar artery occlusion. It is true that a sensitive carotid sinus reflex may mask such a response, but the administration of $1/100$ grain of atropine will destroy the reflex, making the test specific. Syncope on carotid artery compression usually does not occur in patients with mass lesions or with occlusion of the middle cerebral artery or its branches. Intimectomy, anticoagulant therapy, and graduated therapeutic carotid compression are all measures available for increasing the blood flow through a cerebral vessel afflicted with atheromatous occlusion.

—John Martin, M.D.

Surgical Considerations in the Management of Cerebrovascular Disease. E. S. GURDIJIAN, J. E. WEBSTER, W. G. HARDY, and D. LINDNER. *Minnesota M.*, 1958, 41: 327.

THIS ARTICLE is primarily devoted to the treatment of spontaneous occlusion of the carotid artery in the neck. Although other processes resulting in occlusion or interruption of the circulation in the brain are mentioned, such as thromboses, brain tumors, hematomas, embolisms, aneurysms, there is no actual study of them in this report.

In the stroke syndrome, carotid angiograms will reveal that about 10 per cent of the patients have an occlusion of the internal carotid artery in the neck. The types of occlusion may be:

1. An acute fresh occlusion in which a thrombectomy or surgical attempt to remove the thrombus should be performed.
2. A chronic occlusion in which "excision of a portion of the carotid artery and a cervical sympathectomy may be of some value."
3. A partial occlusion in which case an intimectomy could be performed.

In the case of intimectomy it is thought that carotid compressions should be performed in order to establish whether there is some circulation on the affected side, since in these cases it may be important to know whether the patient can tolerate the period of complete occlusion during surgery. If there is some circulation then intermittent carotid compression may be done for several days in order to help increase circulation. If not, the operation should be performed under hypothermia. Intimectomy was performed in 7 patients, and there is a photograph of one showing the patency of the vessel after surgery by arteriography; however, there is no discussion of results in the other patients.

Of the entire series of 55 patients in which the neck was explored, 5 had acute occlusion. Surgery in these 5 revealed that only 3 bled from the distal portion of the artery after removal of the clot. Postoperative angiograms several weeks later revealed that in 2 of these clotting had recurred. Apparently in the remaining 50 patients, a resection of the vessel and sympathectomy were performed, but this is not actually stated and the percentage of results is not given.

The possibility of using a grafting material is discussed, but in the authors' experimental use of crimped nylon grafts in dogs, there was a rather high percentage of occlusions from intimal growth after a period of several months. Hence the feeling is that at the present time grafting procedures may not be satisfactory for long periods; nevertheless further study may reveal better grafts and procedures.

—Jack I. Woolf, M.D.

Pitfalls and Success in Surgical Treatment of Focal Epilepsy. WILDER PENFIELD. *Brit. M. J.*, 1958, 1: 669.

ON THE BASIS OF his 30 years of experience in the field of surgery for the treatment of focal epilepsy, Penfield brilliantly outlines his thoughts on the pitfalls which await neurosurgeons interested in this field of endeavor. After a brief reference to the previous surveys which had been made, pointing out that in 234 cases the attacks were stopped in 41 per cent and markedly lessened in 35 per cent, he no longer referred to any statistical material. The case mortality in a total of 470 patients was 1.5 per cent.

Penfield points out that simple adhesions between the dura and the arachnoid are not to be considered as cause for seizures unless the underlying cortex has been damaged. He thinks that the most satisfactory way of preventing adhesions secondary to operation is to cover the surface of the brain with an impermeable material during the conduct of the procedure, unless exposure is absolutely necessary. In his opinion postoperative cerebral edema can also be considerably reduced by keeping the cortical surface well covered. This may be done by carrying out preliminary cortical stimulation and electrical recording through the intact dura, thereby limiting the cortical exposure to as small an area as is essential.

The postoperative changes which occur in the brain are termed "neuroparalytic edema" by the author, and he feels these are probably related to alterations in the cell chemistry produced during the brain exposure. He attributes the postoperative seizures which may occur, as well as the temporary neurological deficits, to this process.

Turning his attention to the so-called "aseptic meningitis," Penfield remarks that this condition is more frequent after cortical excision of atrophic lesions in the treatment of focal seizures than it is after craniotomies for other purposes. He believes this syndrome is related to irritating substances derived from the breakdown of clotted blood in the region of the wound, and that it is particularly persistent and bothersome if the ventricle has been opened. The author therefore recommends closure of the ventricle, if possible, by loose suturing of the ependyma over a square of "jellfoam."

Concerning the actual technique of cortical excision, the author states that complete removal of an epileptogenic focus is essential when possible. He believes that this must be done by the technique of subpial dissection in order to prevent the formation of a new focus at the margin of the operative wound. The surgeon's guide, following reliable preoperative electroencephalographic studies (which should prevent him from operating upon those patients whose focus lies deep in the brain stem) is first, the clinical pattern of the seizures, second, the gross appearance of the brain, and third, the direct electrocorticogram. Unless atrophic tough gyri are removed the operation will be a failure. The removal of an objectively normal gyri is useless, although it may be necessary on occasion in order to reach buried abnormal brain. If persistence is applied and excision continued until no spikes are obtained on the electrocorticogram the chance of success will be great.

Finally, the author points to the hazard of interfering with the lenticulostriate arteries while carrying out resections of abnormal foci in the region of the insula or in the frontal and parietal opercula. He warns neurosurgeons to beware of badly scarred brain tissue lying above the fissure of Sylvius and to beware as they approach the anterior perforated space.

In conclusion, Penfield stresses that only the patients whose attacks are not controlled by the best medical therapy or possibly those whose abnormal behavior is related to the discharging focus should be considered for surgery. It is emphasized that this is a field in which medical team work between the surgeon, the neurologist, and the electroencephalographer is a prerequisite for success. This article should be of great value to those who are interested in this particular aspect of neurological surgery.

—Joseph Ransohoff, M.D.

Advantages and Limitations of Pallidal Surgery in the Treatment of Parkinson's Syndromes (Intérêt et limits de la chirurgie pallidale pour le traitement des syndromes parkinsoniens). J. CAMBIER. *Presse méd.*, 1958, 66: 602.

THE TREATMENT of Parkinson's syndrome by surgery performed on the pyramidal tracts was abandoned because of poor results and at present an intervention on the globus pallidus is being practiced. Section of the pallidofugal paths, however, is a dangerous procedure and in 1950 a method of electrocoagulation was introduced to sever the extrapyramidal tract in the region of the globus pallidus. There are now many different operative methods but all of them have to be performed in a well limited and localized region to spare the areas in which important formations, such as the capsula interna and hypothalamus are located. Operation should be conducted on a conscious patient, if possible, to be able to evaluate results during the procedure. The adopted technique at present is the introduction of an instrument through a trepan hole in the skull under x-ray control assisted by visualization of the mammillary bodies and the foramen of Monro with encephalography or lipiodol ventriculography.

Electrocoagulation is predominantly used by neurosurgeons in France but Cooper prefers to use repeated injections of alcohol with a cannula left in place, at intervals of several days. When electrocoagulation or alcoholization are used a high transfrontal approach is preferred.

At the present time it is still impossible to compare results of the different operative procedures. The experience gained from the study of intervention on the pyramidal tracts with accompanied probable destruction of the globus pallidus shows that these procedures can cause improvement of the rigidity and tremor but akinesia does not change. A dominant

akinesia and bradykinesia are contraindications for surgery. The impaired speech, the masklike appearance of the face, the oculogyration, the equilibrium and gait disturbances if they are not a result of rigidity, are not at all or but little improved by operation. An improvement of the psychic condition of the patient seems to be frequent.

Although the Parkinson's syndrome as a rule is bilateral the signs are usually more dominant on one side. In these cases unilateral operation is sufficient and sometimes can be so successful as to improve the other side. As a rule a bilateral operation is indicated. Unilateral or bilateral operation should be followed by rehabilitation.

Immediate results of operative procedures are sometimes seen even during operation and are an effect not only of destruction of descending pallidal paths but also of a temporary functional disturbance in the vicinity of the globus pallidus. This disturbance could explain the recurrence of symptoms in a relatively high percentage of cases in which operation has been performed. Rigidity and tremor although in attenuated form sometimes return in the first few days after surgery and it is possible for them to appear in the first few months. These signs seldom reappeared when a good operative result persisted for 3 to 4 months. Reoperation could be performed in case of relapse. Good results are not only due to precise localization of destruction of pallidal paths but also of a sufficient extension of this destruction.

The mortality is higher in cases in which a craniotomy was performed in comparison with cases in which a trepan hole was made. The mortality using the trepan hole procedure is 2 to 3 per cent, relatively low if we consider that these patients are old and arteriosclerotic.

The most frequent cause of postoperative death is a deep cerebral hemorrhage in the region of the gray nuclei. Some patients die of renal insufficiency or an aspiration pneumonia. Complications such as aphasia, visual disturbances, and hemiplegia are the result of the operative technique and the varying surgical approach. The appearance of psychic signs is ordinarily attributed to the preoperative condition of the patient.

Surgery in Parkinson's syndrome is indicated when the physical inconvenience is pronounced and in cases in which medical treatment seems to give no results.

Senility, advanced cerebral arteriosclerosis, vegetative disorders particularly when the respiratory system is involved, and psychoses and severe neuroses are contraindications for surgery.

—*M. Srokowski, M.D.*

The Importance of Autopsy in Surgery with Some Remarks About Tumors of the Hypophysis (Die Bedeutung der Sektion fuer die Chirurgie mit einigen Bemerkungen ueber Hypophysentumoren). W. BERBLINGER. *Medizinische*, 1958, p. 705.

THE PATHOLOGIST plays an important part in the development of surgery. To have a successful autopsy it is very important that the pathologist have more details than just the clinical diagnosis. The past history and the history of the present illness are important as well as the kind of anesthesia given during surgery, the findings during the operation, and the postoperative medication. It is only with such details that extra laboratory studies can be done at autopsy. The autopsy should include more than a review of the operative area. It is also advisable that the surgeon be present during the autopsy, not only for his own benefit but also in case further questions should arise, which can only be answered by him. This close cooperation has contributed to the development of surgery to the standing it has achieved at the present time. Even with the most advanced technique in cardiac surgery, there is no doubt that the surgeon has to start his training with the knowledge of the different congenital abnormalities of the heart which he can learn only from the pathologist. In this way he will be able to master any situation which may occur during surgery.

The operations on tumors of the cerebellum, like neurinomas and glioneurinomas, still have a high mortality. If death occurs postoperatively, it is usually due to the ceasing of respiration. At autopsy the author has always found irreparable damage of the respiratory center. The plasma caused swelling and an autolysis of the nuclei took place. This damage had resulted in an increased anemia in the area of the medulla oblongata. Changes in this area have also been found which were caused by tumor of the hypophysis, involving the circle of Willis. Five of the author's patients died after a period of apathy and somnolence. Autopsy of the brain revealed adenoma of the hypophysis. The pressure on the arterial supply caused the aforementioned clinical symptoms, which apparently have previously been misinterpreted.

Constant search and alertness on the part of the pathologist and co-operation with the doctors who are treating the patient will contribute to further improvement in surgery.

—*Frank R. Lichtenheld, M.D.*

Contribution to the Angiographic Study of Tumors of the Temporal Lobe (Contributo allo studio del quadro angiografico dei tumori temporali). L. GESSINI and G. STRADONE. *Anatomiae chir.*, 1957, 2: 334.

THE AUTHORS discuss the use of cerebral angiography in the study of temporal lobe tumors and believe that tumors arising in the periphery or lateral portion of the temporal lobe can be distinguished from those arising in the medial or basal region.

It is their impression that the peripherally placed tumor causes the following: (1) a more or less pronounced displacement of the anterior cerebral artery, (2) an upward displacement of the sylvian vessels which is equally evident in both the frontal and lateral projections, and (3) a pushing together of the sylvian vessels.

The medially placed tumor, on the other hand, causes: (1) a spreading out of the sylvian vessels as seen on lateral projection, (2) no displacement of the anterior cerebral vessels, and (3) a paradoxical behavior of the sylvian vessels in that they appear to be elevated in the lateral projection but depressed in the frontal projection.

The article is well illustrated.

—*Nicholas Wetzel, M.D.*

SPINAL CORD AND ITS COVERINGS

Physiopathology of the Herniated Intervertebral Disc (Physio-pathologie des hernies discales). P. Decoulx, E. Houcke, J.-P. Razemon, and Lemerle. *Lille chir.*, 1958, 13: 5.

The authors report 168 cases of surgically treated herniated intervertebral disc. By microscopic examination of the removed specimens they tried to determine the cause of recurrence of sciatica orginating from a ruptured disc.

There are four stages of herniated disc.

1. Bulbing disc, when there is only a distention of the annulus fibrosus (17 per cent of authors' cases).

2. The true herniated intervertebral disc, not exteriorized. In this stage the annulus fibrosus is broken, but the posterior longitudinal ligament is preserved; this is called a dissecting protrusion (50 per cent of the cases).

3. The herniated exteriorized disc protruding into the peridural space. The herniated part is attached to the disc by a pedicle (28.5 per cent of authors' cases).

4. The herniated part completely free with no pedicle. This type is rare and represented only 3.5 per cent of authors' cases.

Histologic examination of the removed specimens was performed in 70 cases. The herniated part can be a portion of the annulus fibrosus (nonexteriorized herniated disc) or as more often occurs, of both of the above elements. The sciatica caused by a ruptured disc is characterized by remittent pain but what induces these recurrences is not as yet established. Many hypotheses have been advanced to explain relapses of pain; some of them accuse the herniated disc, others, changes in the spinal nerve roots.

Posterior herniation of the disc, as proved by experiments on cadavers, can slip out and reduce itself (intermittent prolapse). When the fissure in the disc is blocked, strangulation occurs. Some workers believe that a status of accommodation probably exists between the herniated disc and the spinal nerve roots. When the new herniation occurs, the herniated part of the disc increases its size and diminishes when the herniated part undergoes a fibrous organization. Some workers explain the recurrences of the pain by edema of the protruded part.

In their discussion of the spinal roots the authors mention the macroscopic signs of congestion; the microscopic lesions (discrete nerve degeneration accompanied by an acute interstitial neuritis); and functional disturbances (pain, hypoesthesia or anesthesia, paresthesia, abolishment of reflexes, muscular hypotonia, and seldom, paresis).

Pain is the dominant symptom in the clinical picture.

The herniated disc can induce stretching, compression, and angulation of the nerve. The angulation plays the most important role in the etiology of pain. Histologic study reveals inflammatory infiltration and localized edema of the nerves. These conditions can be reversible and relapsing. They are reversed by rest and medications; they relapse with fatigue, cold, and trauma.

The mechanism of the pain is not clear; it seems that an artificial synapse is produced at the level of the compression of the nerve or that the pain is a result of vascular disturbances.

Surgery is indicated in cases of nonreversible conditions, in exteriorized or free herniation of the disc. The operative procedure consists of removal of the herniated part and curettement of the disc.

The authors achieved excellent operative results in: 70 per cent of nonexteriorized herniations, 76 per cent of the exteriorized herniations, 100 per cent of the free herniations, and only 40 per cent of the bulbing discs.

—*M. Srokowski, M.D.*

Hemangioma of Cervical Vertebrae with Spinal-Cord Compression. Leonard R. Robbins and Edmund M. Fountain. *N. England J. M.*, 1958, 258: 685.

The authors give an extensive bibliography and review of this relatively rare condition with a description of one personal experience. Familiarization with this diagnostic possibility is none the less important for any physician likely to see problems of increasing cord dysfunction. Progression can be rapid and early diagnosis by x-ray can result in long term remission from radiation therapy alone.

The authors do not stress that because the lesion usually exerts its pressure on the ventrum of the cord, these patients often develop spastic weakness in the absence of root pain or sensory changes to suggest generalized cord compression, and hence are not recognized as suffering from mechanical cord compression until a serious functional deficit has occurred. Although the results of even late surgical decompression and radiation therapy can be gratifying, earlier diagnosis and intervention with reduced short term and permanent morbidity should be feasible.

—*Frank E. Nulsen, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

The Surgical Treatment of Pectus Excavatum. ROLLIN A. DANIEL, JR. *J. Thorac. Surg.*, 1958, 35: 719.

THERE is general acceptance of surgical correction of the abnormality generally referred to as pectus excavatum, particularly with regard to the indications for surgery when the deformity is mild or when the patient's physical development otherwise is unimpeded, and also with regard to the proper age at which surgery should be undertaken. The clinical manifestations and the indications for operative correction fall into three categories: cosmetic, functional, and orthopedic or postural, the last category being a function, in part, of the first two.

Since 1948, the author has operated upon 35 patients with funnel breast deformity. Five patients were adults, the youngest was 6 months of age and the oldest 42 years. External fixation by means of wire sutures was utilized in only the first 2 patients. No splinting, either external or internal, was used in the remainder.

It is emphasized that external fixation of the mobilized sternum, by means of metal sutures or splints or by grafting, is not needed, and a modified Ravitch operation is described which was performed on 29 patients since 1954.

The results in the patients on whom this procedure was carried out have been satisfactory on the whole. In the majority the sternum has been maintained in good position. In a few there was slight retraction of the lower end of the sternum and, in these few patients, this was not noted during the early postoperative period but always after a period of at least 6 weeks. Thus, an external prosthesis to maintain or "over-correct" the position of the sternum would not have accomplished its purpose if it had been removed within the first 2 or 3 weeks after the operation.

The procedure involves an extensive dissection and mobilization of the sternum and the adjacent anterior chest wall, and no external prosthesis or splint is employed. The postoperative care is simple. Complications have been few and the total period of hospitalization rather short. The procedure has been carried out on patients with varied types of funnel chest deformity and on one patient with pectus carinatum or pigeon breast. The results, from both the functional and cosmetic standpoint, have been satisfactory.

—Stephen A. Zieman, M.D.

Paget's Disease of the Breast (La maladie de Paget du mamelon). P. ISIDOR. *Bull. Soc. Roy. Belg. gyn. obst.*, 1957, 27: 575.

PAGET'S DISEASE, as a clinical entity, results from varying pathological changes and should not be dogmatically ascribed to an underlying glandular carcinoma of the breast. To support his contention the author presents 4 cases in detail.

The first patient, aged 72 and wife of a physician, developed a small cystic tumor beneath the areola. A year or 2 later, when the nipple showed eczematoid changes, operation revealed that the tumor was cystic and contained several papillary growths. After the breast was removed, histological examination established a benign epithelioma in a collecting duct and the typical dyskeratotic appearance of Paget's disease.

In the second case, a 65 year old female, induration beneath the areola and eczematoid changes of the nipple were noted without axillary node enlargement. Simple mastectomy was performed and a malignant tumor, probably of skin adnexal origin, was confined to the subareolar region. No tumor was found in the deeper breast, and the nipple showed typical Paget lesions.

The third case presented an extensive eczematoid change of the nipple and breast which, although showing some features of Bowen's disease, appeared to arise from atypical changes in the exocrine sweat glands, and typical Paget cells were found. There was no involvement of the remaining breast.

In the fourth patient a small eczematoid lesion of the areola with underlying induration proved to be a junctional nevus and a small comedo carcinoma of the collecting ducts. Again the remaining breast contained no tumor. *—John H. Wulsin, M.D.*

Experimental Studies on the Histogenesis of Mammary Tumors and Sexual Hormones. TETSUYA KOSHI. *Arch. jap. chir.*, 1958, 27: 323.

AN EXTENSIVE GROUP of studies was carried out on hybrid mice in order to evaluate the relationship between neoplastic diseases of the breast and the influences of abnormal lactation and hormonal stimulation. Carefully prepared whole mount preparations of the mammary glands of the mice were studied and compared with microscopic sections. The various groups of mice included lactation groups (269 cases), consisting of a normal breeding group of 88 mice, a non-breeding group of 21, and interrupted breeding groups of 160 mice. Another group of 110 virgin females was also studied. There were two groups of mice on whom hormonal influences were investigated, 62 mice that received estrogens and 40 that received androgens.

Normal breast development was studied by careful gross and microscopic preparations. In the mammary glands of multiparous females with spontaneous mammary cancer, numerous abnormal changes were noted, and these changes were divided into three types of lesions. There were also four classes of mastopathy (chronic mastitis) given by the author, two of which were most frequently found. In evaluating the influences of nursing on breast lesions, the lactating mice were separated into three subgroups. One subgroup was permitted to nurse for 30 days, one group for 5 days, and some mice were separated from their offspring immediately after delivery. Mastopathylike changes and mammary cancer were found in 19.3 and 15.7 per cent, respectively, of the mice that nursed their young for 30 days. The comparable figures were

29.3 and 37.1 per cent for mice that nursed for only 5 days. In nonbreeding mice, the respective data were 33.3 and 26.7 per cent. The highest incidence of spontaneous mammary cancer was thus in the group of interrupted nursing at 5 days postpartum. While mastopathylike changes with regression delay of breast tissue after lactation occurred frequently, mammary cancer with regression delay occurred infrequently. The incidence of chronic mastitis in the virgin female group was only 3.6 per cent, and mammary cancer did not occur in these mice.

Estrogen pellets (1.25 mgm.) were implanted subcutaneously in 30 day old mice every 50 days for a total of 3 implants per animal. In 30 of these 62 females, a double amount (2.5 mgm.) of estradiol was used. Mammary adenocarcinoma was recognized in 6 of 44 mice which survived 91 days after the original implantation, and in 3 of the 6 animals lung metastases were also found. Mice treated with the large doses of estrogen died quickly. Mammary hyperplasia caused by estradiol regressed gradually in 30.8 per cent of the surviving mice, while 69.2 per cent showed continued hyperplastic changes after implantation was stopped. In 3 of the 9 cases with prolonged hyperplasia, mammary cancer developed. Although the incidence of mammary tumors in the estrogen-stimulated group was lower than that of the lactation groups, this apparent discrepancy was attributed to the earlier death of many animals treated with estrogen.

Testosterone pellets (6.25 mgm.) were administered subcutaneously to another group of 40 mice on the same schedule of 3 doses 50 days apart. Breast hyperplasia was reduced, although all these females showed type I mastopathylike changes in 9 to 17 months after the first implant. Later, the hyperplasia also underwent gradual regression. Mastopathylike changes and tumors caused by estrogens and androgens arose spontaneously from the prevention of nursing, and were morphologically similar. It was concluded that the changes simulating chronic mastitis and actual mammary cancer arose from excessive estrogen stimulation and repeated pregnancies. These lesions appeared more often in abnormal breeding and nonbreeding mice than in normally breeding animals. It was further concluded that pathologic changes due to abnormal nursing cause disturbance of the sexual rhythm, and should be carefully noted. These factors might influence the sensibility of the breast epithelium, and might thereby be associated with an inherent predisposition to neoplastic mammary growths.

—Emile L. Meine, Jr., M.D.

Carcinoma of the Breast Associated with Pregnancy; Report of 56 Cases Followed 5 Years or More. THOMAS T. WHITE. *Northwest M.*, 1958, 57, 477.

MANY PATIENTS operated on for breast cancer during pregnancy or lactation survive for long periods. Their survival is comparable to that of patients without these additional problems. A study of 56 cases of breast cancer associated with pregnancy or lactation is presented in this paper. About 10 per cent of the women with breast cancer are in the child-bearing age group. Actually the incidence of breast cancer on obstetrical services in this country is only about 3 per 10,000 pregnancies. During pregnancy, as would be expected, when the disease is localized to the breast the prognosis is much better than when the disease has spread to the axillary nodes. Likewise, the survival rate improves when the delay between diagnosis and surgery is proportionately shorter. Whether the coexistence of pregnancy and lactation predisposes to earlier or more extensive metastases is not known. In this series, 61.5 per cent of patients without metastases who were treated during pregnancy or lactation survived more than 5 years. With metastases the 5 year survival fell to 10 per cent. The vast majority of patients seen already had axillary metastases when they were treated. The author concludes that abortion cannot be shown to influence the course of the disease beneficially.

—Sheldon Oscar Burman, M.D.

Breast Cancer in Connecticut, 1935-1953. ALLAN J. RYAN, MATTHEW H. GRISWOLD, EDWARD P. ALLEN, ROLF KATZENSTEIN, and Others. *J. Am. M. Ass.*, 1958, 167: 298.

IN ORDER to evaluate changes in the survival rate due to earlier diagnosis and improved treatment of breast cancer, an analysis was made of 8,396 case reports of microscopically proved primary cancer of the female breast submitted by 30 hospitals in the state of Connecticut from 1935 through 1953. The cases were divided into groups 1 (1935–41), 2 (1942–48), and 3 (1949–53). Five year follow-up data regarding survival were available on the two 7-year groups, 1 and 2. Group 3 was useful in comparing the incidence of disease and the forms of treatment. The survival figures were calculated from "determinate" groups of well documented cases which comprised 94 per cent of group 1 and 89 per cent of group 2. Procedures described by the surgeon as "radical" were so classified, all others except biopsy being classed as "limited." There was obviously no uniformity in the selection of patients, choice of surgical procedure, or radiotherapy. Neither supplemental nor ablative hormonal therapy was considered in this study.

The principal criterion of "localized" disease was based on the absence of metastatic axillary nodes removed at operation, admittedly a crude measurement. A significant increase of 5.6 per cent of cases thought to be localized occurred in groups 1 to 2, but did not further increase in group 3. Cancer was graded in only 59.6 per cent of the total cases, unfortunately fewer recent cases being graded. However, cancer of grades 1, 2, and 3 roughly made up 10, 60, and 30 per cent of the 5,008 graded cases, and the proportions were fairly constant in all 3 groups. For purposes of analysis, age groups of under 45, 45 to 54, 55 to 64, 65 to 74, and 75 years or over were established. More cancers are being found in the oldest age category over the years. The relative numbers of patients treated by limited surgery, by radiation alone, or by limited and radical surgery combined with radiation have declined considerably from group 1 to group 3. Preoperative radiation was rarely used. Radical surgery, with or without radiation therapy, was employed on 67. 7 per cent of group 1 patients, on 74.6 per cent of group 2, and on 78.3 per cent of group 3.

Five-year survival increased slightly from group 1 to group 2 (46.3 to 51.0 per cent). The increase came mainly from improved survival of patients with regional metastases. There was a consistent failure of survival for 5 years in about 30 per cent of patients thought to have localized disease which indicated that there was probably a high degree of inaccuracy in the initial tissue studies. Localized disease was highest in the older age groups. The greatest improvement in groups 1 and 2 occurred in patients who received radical surgery plus postoperative irradiation. Significant improvement in survival was also found among patients who received radical surgery in contrast to those given limited operations. In group 2 patients with regional metastases, the 5 year survival after radical surgery was 41.1 per cent, and for those treated by radical surgery plus irradiation it was 42.7 per cent.

Accordingly, the authors strongly recommend combined radical surgery and postoperative irradiation for patients who meet acceptable criteria for treatment. The outlook for survival of the younger women in this series was no worse than for older patients regardless of whether the disease was localized or had spread to the regional nodes. The woman who had a cancer of one breast was five times as likely to develop cancer in the other breast as a woman who did not have one, as well as one and one-half times as prone to develop cancer in other genital organs. —*Emile L. Meine Jr., M.D.*

Excretion of Estrogens in Urine by Patients with Breast Cancer Before and After Oophorectomy, and During Spontaneous Postmenopause (Die Ausscheidung der Oestrogene im Urin beim Mammacarcinom vor und nach Ovariektomie sowie in spontaner Postmenopause). J. M. BAYER, H. BREUER, and W. NOCKE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 84.

DETERMINATION of the amount of estrogens, 17-ketosteroids, and 17-ketogenic steroids in the urine was done according to Brown's method in 9 patients who had cancer of the breast. The term "postmenopause" is applied to the period which starts 3 years after the cessation of menstruation. The authors' findings confirm the statements of other workers that excretion of estrogens continues after oophorectomy and during spontaneous postmenopause. Not only are there great individual variations in the amount of excreted estrogens, but in the same individuals daily fluctuations are also frequently observed. It follows that the result of a single determination is unreliable and that numerous tests at daily intervals are required for the appraisal of excretion of estrogens in women after oophorectomy or those in spontaneous postmenopause. In one patient who underwent oophorectomy and unilateral suprarenalectomy a marked rise of excreted estrogens, 17-ketosteroids, and 17-ketogenic steroids was observed.

The same phenomena occurred after administration of ACTH in 2 oophorectomized patients and one woman in spontaneous postmenopause. The conclusion is justified that the adrenal cortex in such individuals is the source of estrogens. It is questionable, however, whether adrenal cortex is the sole source of estrogens. Proper conditions are required for the physiologic effect of estrogens on the breast and endometrium to take place. Such conditions do not exist in the presence of large amounts of androgen.

Marked objective remissions of breast carcinoma after suprarenalectomy cannot be attributed to elimination of adrenal estrogens. The results await another explanation. —*Joseph K. Narat, M.D.*

TRACHEA, LUNGS, AND PLEURA

The Amnesic Effect of Promethazine Hydrochloride in Bronchoscopy. D. M. PINO and R. J. VAN HOUTEN. *J. Thorac. Surg.*, 1958, 35: 825.

ALTHOUGH AMNESIA is a desirable phenomenon in the patient undergoing bronchoscopic examination, bronchoscopy under topical anesthesia in the conscious or alert patient is an unpleasant experience for both patient and endoscopist. With general anesthesia a muscle relaxant is required for jaw relaxation.

Relaxation by use of general anesthesia, central nervous system depressants, or by a muscle relaxant tends to produce respiratory depression. Such procedures inevitably involve more risk to the patient than actual insertion of the bronchoscope.

Ideally, bronchoscopy calls for: (1) an awake, cooperative patient who can respond to and obey requests of the operator, (2) a relaxed and comfortable patient with a sense of well-being, (3) a patient without respiratory depression, and (4) one who later lacks an unpleasant memory of the bronchoscopic procedure.

Cocaine hydrochloride topical anesthesia and the intravenous administration of meperidine hydrochloride as a sedative-analgesic, as well as tetracaine hydrochloride-cocaine hydrochloride evaluation of promethazine hydrochloride (phenergan hydrochloride) in bronchoscopic examination were employed for 25 unselected patients.

The preoperative medication consisted of: (1) pentobarbital or secobarbital, 90 mgm., given by mouth 90 minutes prior to bronchoscopy, and (2) 60 mgm. of codeine hydrochloride and 0.43 mgm. of atropine sulfate given in a single intramuscular injection 60 minutes before bronchoscopy. At the time of examination, the patient lay in the supine position on the bronchoscopy table. An intravenous drip of 5 per cent dextrose in water was started. A three-way stopcock in the tubing facilitated control of the intravenous drug injections. The blood pressure, pulse rate, respiratory rate, and depth were monitored throughout the examination. When induction was begun a single dose of 50 mgm. of meperidine was introduced through the tubing. The patient was then questioned and observed for relaxation and a "feeling of lightheadedness." The meperidine dose was repeated in 20 mgm. increments at 2-minute intervals until the patient appeared to sleep lightly. To reach the "dosing stage" of sedation, the mean meperidine dose was 150 mgm. and ranged from 40 to 220 mgm. At least 15 minutes were required for the peak effect of the meperidine. When the patient appeared relaxed, the posterior pharynx and larynx were sprayed with a 5 per cent aqueous solution of hexylcaine hydrochloride. After anesthetization of the vocal cords, 2 c.c. of

5 per cent hexylcaine solution were injected between them. A syringe and flexible laryngeal cannula facilitated this last operation which served to anesthetize the tracheobronchial tree. Bronchoscopy was then undertaken.

Of the 25 patients, 15 had complete amnesia during bronchoscopy. Six vaguely recalled momentary and not unpleasant stimulation at some time during the procedure. All were co-operative and obeyed commands when given. All patients were awake or easily aroused and needed little postoperative care. Ten of 25 patients required 100 mgm. of meperidine or less for adequate response. No laryngospasm was observed. Thus, promethazine affords the patient amnesia and obliterates the memory of an unpleasant endoscopic procedure. Meperidine fortified with promethazine is an even more desirable drug regimen in that the sedative-analgesic combination provides a sense of well being undisturbed by pressure or position discomfort. This procedure avoids the use of general anesthesia and its risks to obtain the desired co-operation and relaxation. —*Stephen A. Zieman, M.D.*

Pulmonary Alveolar Proteinosis. SAMUEL H. ROSEN, BENJAMIN CASTLEMAN, and AVERILL A. LIEBOW. *N. England J. M.*, 1958, 258: 1123.

WITHIN THE PAST 5 YEARS 27 cases of a remarkable disease of the lung with a characteristic histologic pattern but variable clinical causes have been collected by the authors at the Armed Forces Institute of Pathology at Yale University, and Massachusetts General Hospital. There were 8 deaths in this group, and lung biopsy material, as well as autopsy material, was available for study.

Roentgenographically the chest film shows a fine, diffuse, perihilar, radiating, feathery or a vaguely nodular, soft density, resembling in its "butterfly" distribution the pattern seen in severe pulmonary edema. When resolution occurs, the lesions seem to disappear beginning peripherally and progressing toward the hilus. Absence of significant enlargement of the hilar lymph nodes is characteristic of alveolar proteinosis.

Clinically, the disease may or may not be heralded by a febrile illness, and in most of the patients the onset was unheralded and there was a creeping, progressive dyspnea accompanied by a cough productive of yellow sputum. Fatigability, chest pain, and slight loss of weight were frequently noted, but physical signs were minimal despite the massive pulmonary involvement noted in the roentgenogram. Death may occur as a result of progressive filling of the alveoli, or from superimposed fungal or bacterial infection which may be abetted by the prolonged use of antibiotics and adrenocorticoids. Corticoid therapy does not seem to affect the course of the disease in most instances, and antibiotics appear to be indicated only in the presence of superimposed acute bacterial infections.

Histologically, the lesion consists of the deposition of a para-aminosalicylic-positive granular and flocular proteinaceous material, rich in lipids, within the lumens of the distal air spaces, where little, if any, reaction is usually produced. This material is derived from granular transformation of proliferated "septal cells," and their subsequent sloughing and necrosis. Acicular crystals and variable, intensely staining laminated bodies, believed to be cellular fragments, were abundant in some fields in almost all cases.

Nothing is known as yet regarding the etiology of the condition. Certain roentgenographic and histologic similarities to pneumocystis infection have stimulated an intensive, but fruitless, search for this parasite. The similarity of the tissue response among the various patients and the clinical differences from pneumocystis pneumonitis suggest some other causative agent—for example, some recently introduced inhalant. The authors urge that the search for a causative agent by microbiologic, chemical, and epidemiologic methods must be pursued with all vigor, since it is evident that the condition is not rare.
—*Gilbert S. Campbell, M.D.*

Role of the Autonomic Nervous System in the Control of the Pulmonary Vascular Bed. MICHAEL G. WEIDNER, JR. and RUDOLPH A. LIGHT. *Ann. Surg.*, 1958, 147: 895.

PULMONARY EMBOLIZATIONS, localized and general, were induced in dogs by the injection of plastic spherules of known size through a double lumen cardiac catheter advanced from the jugular vein into a pulmonary lobar artery. The peripheral arterial pressure, pulmonary artery pressure, pulse rate, and respiratory rate were recorded graphically. Inflation of the balloon of the cardiac catheter with 5 c.c. of water during the injection time caused localized embolization; with the uninflated balloon generalized embolization was obtained. Inflation of the balloon per se did not affect the pulmonary arterial pressure. Plastic spherules, 35 to 100 micra in size and administered in doses of 200 mgm. to 2 gm., caused a marked increase in the pulmonary artery pressure. Large particles, from 105 to 177 micra and injected in doses of 200 to 750 mgm. did not affect the pulmonary artery pressure, but in doses up to 2 gm. they caused pulmonary hypertension, peripheral hypotension, and hyperpnea. These manifestations appeared to be reflex in type, originating in vessels of 25 to 100 micra in diameter with mediation through the sympathetic nervous system. In vagotomized animals, pulmonary embolization failed to produce hyperpnea. Embolization produced during endotracheal positive pressure accentuated all reactions. In sympathectomized animals the neurogenic responses to pulmonary embolization were abolished.
—*B.G.P. Shafiroff, M.D.*

Changes in the Pulmonary Circulation Due to an Endotracheal Metallic Foreign Body (Alcuni rilievi sulle modificazioni fisiopatologiche del piccolo circolo indotte dalla presenza di un corpo estraneo metallico endobronchiale). P. PIETRI, D. GALMARINI, and A. PERACCHIA. *Arch. chir. ortop. med.*, 1958, 23: 39.

A CASE OF LOBECTOMY for an endotracheal foreign body is reported. The patient, a 23 year old white male, complained of persistent cough with puslike sputum for 3 years prior to hospital admission (University of Milan Medical School, Surgical Clinic). However, no episode of accidental swallowing of a foreign body was remembered.

Physical examination revealed a well developed, well nourished young adult in no acute distress. No

pathological findings were noted except for clubbing of the fingers and a limited area of dullness at the right pulmonary base. Auscultation revealed a few rales in the same area. A chest roentgenogram showed the presence of a foreign body in the lower left bronchus. Bronchoscopy revealed a stricture of the lower left bronchus with a large amount of pus obstructing the lumen. Interestingly enough, bronchospirometry showed just a slight hyperventilation of the left lung, and a definite decrease of blood supply to the entire left lung was demonstrated by angiopneumocardiographic methods.

At surgery the bronchial arteries of the involved lung were seen to be obviously distended, widely pulsating, and tortuous. Samples of blood were obtained from the lower left lobe artery and from the right ventricle. Gas analysis revealed a higher oxygen content in the blood drawn from the former. The operation consisted of resection of the left lower lobe, which was accomplished without particular difficulty. The patient withstood surgery very well and enjoyed an uneventful postoperative period. He was discharged 3 weeks later with no complaints.

This case offers the authors an opportunity to discuss the relationship between the pulmonary and the bronchial circulations of the lungs. On the basis of laboratory and, especially, surgical findings, it can be stated that the anastomoses between the pulmonary and bronchial circulations, present even in physiological conditions, were in this particular case abnormally developed so as to represent a real shunt between the two systems. This shunt seems to offer the most plausible explanation as to the cause of symptoms displayed by the patient.

—R. Benvenuto, M.D.

Direct Lymphatic Connections from the Lower Lobes of the Lung to the Abdomen. KENNETH K. MEYER. *J. Thorac. Surg.*, 1958, 35: 726.

ABDOMINAL METASTASIS is relatively common in cancer of the lung. Of the 3,047 collected cases of pulmonary cancer studied by Ochsner and DeBakey, 78 per cent were metastatic to the mediastinal lymph nodes, 33 per cent to the liver, 20 per cent to the adrenal glands, and 17 per cent to the kidneys. In 20 per cent of the 1,298 cases in which such information was recorded, metastasis to the abdominal lymphatics and dissemination to the abdominal organs may be by way of the lymph or blood vessels, by direct extension of the tumor, or by any combination of these. It is still uncertain which route of spread is most important and at what point, in the course of pulmonary carcinoma, metastasis occurs.

In order to ascertain more clearly the spread of carcinoma abdominally, stillborns and neonates, anatomically normal, were obtained after storage in a morgue refrigerator for 72 hours. In some, injection and study were done immediately, but most of them were preserved by freezing at —10 degrees F. from several days to months. This freeze storage had no noticeable effect on the injection. Since lymphatic vessels are more successfully injected when the tissues are warmed, all specimens were thawed and immersed in warm water to bring them as closely as possible to body temperature.

The lymphatic drainage of the lower lobes of the lung was studied to determine if any lymphatic vessels from the lung course directly to the upper part of the abdomen. When the lungs were warmed they were inflated. India ink, diluted 1 to 3 with distilled water, was injected subpleurally into the mediastinal and diaphragmatic surfaces of the lobes and the ink-filled vessels were traced to their terminations. The anatomic relationships of the pulmonary ligament were carefully maintained during the injection. Eighteen specimens were successfully injected. The lymphatic vessels of the right lower lobe were demonstrated in 15 of these and those of the left lower lobe in 12 specimens.

Vessels from the right lower lobe that coursed to the celiac nodes without interruption were observed in 2 specimens. They entered the abdomen by passing through the esophageal hiatus and then ran on either crus to the nodes about the celiac axis. Other lymphatic vessels from the right lower lobe, which ran in the pulmonary ligament to the diaphragm, were demonstrated in 9 specimens. On reaching the diaphragm they either joined with the lymphatic vessels of the posterior diaphragm or ended in a preesophageal diaphragmatic node. Some of the efferents of this node group ended in nodes about the celiac axis.

The communications of the lymph vessels of the posterior diaphragm with those of the lungs, liver, adrenals, kidneys, and abdominal lymph nodes have been reviewed. From these observations the conclusion is drawn that pulmonary lymph normally drains to the abdomen, and that early, direct metastasis of pulmonary cancer to the abdomen, through the vessels demonstrated, may account for the frequency of intra-abdominal metastases in pulmonary cancer.

—Stephen A. Zieman, M.D.

Resection for Pulmonary Tuberculosis; A 4 Year Follow-Up Study. D. BONTA HISCOE, WILLIAM F. THOMPSON, THOMAS J. ENRIGHT, and HARRISON BLACK. *N. England J. M.*, 1958, 258: 863.

THE AUTHORS report a series of 80 resections for pulmonary tuberculosis performed between January, 1949 and January, 1953. The chemotherapy utilized in this period was not uniform and yet it was roughly possible to divide the case material for purposes of analysis into four groups: those with more than 30 days of preoperative chemotherapy, those with less than 30 days of preoperative chemotherapy, those with more than 180 days of total chemotherapy, and those with less than 180 days of total chemotherapy. The observation period was limited, from 6 months preoperatively to 6 months postoperatively, and beyond these limits chemotherapy was thought to have little bearing on the results of resection. Preoperative chemotherapy did not alter the occurrence of tuberculous complications since in 14 per cent of the patients with no antecedent drug treatment and 13 per cent of those with such treatment, postoperative recurrence was noted. Eighty-five per cent of the patients are well with a negative sputum after a minimal follow-up period of 4 years. Most poor results were apparent within 18 months after operation. Seventy-seven per cent of the patients had positive sputum, 23

per cent had unstable cavitary disease, 20 per cent underwent resection because of thoracoplasty failure, and 51 per cent had bilateral disease. It was found that even in the presence of a positive sputum satisfactory results were obtained in 69 per cent and comparable results were obtained in those with a negative sputum in 88 per cent. Of the patients with unilateral disease 92 per cent had a satisfactory result as contrasted with only 52 per cent of those with bilateral disease. Twenty-seven per cent of patients with open positive cases had major complications illustrating the hazard of resection in such patients. When bilateral disease was added to open positive lesions 46 per cent had an unsatisfactory result. Postoperative thoracoplasty did not appear to alter results favorably unless it was done for a specific complication. Anticipation of a good long term result appeared to be justified with the following factors: unilateral disease, a stable residual lesion, negative sputum, preoperative chemotherapy for 30 days or more, total chemotherapy for 180 days or more, and prompt conversion to negativity postoperatively. —*Allan D. Callow, M.D.*

The Surgical Treatment of Pulmonary Tuberculosis in the Mentally Ill; A 5-Year Study of 403 Resections. ALBERT MOWLEM, COLEMAN J. CONNOLLY, and BERNARD ZIMMERMANN. *Surgery*, 1958, 43: 913.

MODERN CIVILIZATION demands that the surgical diseases of the insane shall be as carefully treated as those of persons of sound mind.

It has long been known that the incidence of pulmonary tuberculosis in state mental hospital inmates is high because of overcrowded conditions in these hospitals and the impossibility of enforcing adequate hygienic measures. In the State of Minnesota these patients (and some groups of Indians) represent the last large reservoir of tuberculosis, and it is believed that by eliminating the potential hazard of spread to other inmates and to the general population tuberculosis could be controlled almost completely and reduced to only occasional cases.

The present report represents a review of the surgical experience obtained from 403 pulmonary resections performed on 338 patients during a 5 year period from July 1, 1952, when tuberculosis therapy at Anoka State Hospital became a co-operative effort with the Department of Surgery of the University of Minnesota, to June 30, 1957.

The patients were adult psychotic and mentally defective individuals transferred to Anoka from the 10 mental institutions in Minnesota. They were referred on the basis of positive cultures of gastric washings or suspected lesions on roentgenograms. Upon arrival 6 consecutive cultures of gastric washings were obtained prior to instituting antibiotic therapy. Such cultures were repeated if initially negative chest roentgenograms strongly suggested the presence of tuberculosis. Subsequently all patients with bacteriologically proved tuberculosis and those with typical lesions but consistently negative cultures were placed on antituberculosis medication.

Patients with minimal disease whose lesions regressed progressively within 2 or 3 months after the institution of medical therapy, and whose lesions eventually disappeared were not considered surgical candidates and continued to receive antibiotics for the duration of their treatment. Patients whose lesions regressed after a few months of antibiotic therapy to small, stable nodules without open cavities were operated upon and their lesions excised.

The selection of patients for operation was made as follows: when lesions were small, peripheral in location, and away from segmental and subsegmental bronchi, wedge resections were carried out. When the disease was more extensive and involved one or more segments of a lobe, but not the entire lobe, segmental resections were performed whenever possible in order to leave intact as much healthy pulmonary tissue as possible. Care was exercised not to cut across diseased lung. Lobectomy was performed when the major part of the lobe was involved. Tuberculous bronchiectasis was considered a segmental disease and treated by appropriate resection. Pneumonectomy was limited to those patients in whom most of one lung was destroyed and whose opposite lung was relatively uninvolved and displayed adequate function. Most bilateral resections were performed in stages at 3 to 9 month intervals. Only 20 bilateral simultaneous resections were performed, usually on younger patients, when extensive resection was anticipated on either side.

Although all patients received from 200 to 300 mgm. of isoniazid (INH) daily in divided doses and 1 gm. of streptomycin sulfate intramuscularly twice a week for a total of at least 18 months (a minimum of 6 months of which was received after the last surgical procedure) a program of treatment with large doses of INH supplemented by pyridoxine to prevent damage to the nervous system has been employed in a few selected cases and during the 2 weeks following surgery, and the routine therapy was intensified and modified to include 1 gm. of streptomycin daily in addition to daily INH and penicillin. After recovery from the operation the routine schedule of INH and streptomycin was resumed.

Care after thoracotomy in the mentally disturbed has its peculiar problems in addition to those expected in mentally alert patients. These problems attained great importance in this series because the group included many types of psychosis and mental deficiency. Usually these patients are unable to comprehend what is taking place and therefore their active co-operation during the postoperative period is almost nonexistent. Such simple but important voluntary measures as coughing and deep breathing are not possible and must be replaced by endotracheal suction. Tracheotomy was very frequently resorted to as the best method of cleansing the respiratory tree. These difficulties have contributed to the morbidity and the mortality from the common complications of thoracic surgery.

Among the 403 pulmonary resections performed on 338 mentally disturbed patients during the period between July, 1952, through July, 1957, there were 289 segmental resections, 67 lobectomies, 23 pneumonectomies, and 24 wedge resections carried out in unilateral, staged bilateral, and bilateral simultaneous procedures with an over-all operative mortality rate of 8.2 per cent and a patient mortality rate of 9.7 per cent.

The most serious postoperative complications were: respiratory embarrassment, pneumonitis, sudden pulmonary embolism, postoperative spread (tuberculous) and recurrence, bronchopleural fistula with empyema, cardiovascular accident, cardiac decompensation, empyema, massive pulmonary hemorrhage, massive atelectasis, transfusion reaction, and cardiac arrest. —*Stephen A. Zieman, M.D.*

Pulmonary Function Before and After Pulmonary Resection in Tuberculous Patients. R. Drew Miller, Ezra V. Bridge, Jr., Ward S. Fowler, H. Frederic Helmholz, Jr., and Others. *J. Thorac. Surg.*, 1958, 35: 651.

To gain further knowledge of the effects of pulmonary resection, pulmonary function studies were performed on 23 adult tuberculous patients about 2 weeks before and 2 to 6 months after resection. There were 12 men and 11 women, with a mean age of 39 years. One to five bronchopulmonary segments were removed without additional space-filling procedures following a period of combined chemotherapy and modified rest in bed averaging 8 months.

Postoperative changes varied within each of the groups classified according to the number of segments removed. The vital capacity was reduced in almost all cases, the average reduction being similar in all groups. In contrast, the average residual volume was unchanged in patients in whom one or two segments were removed but was reduced in those having three to five segments removed. The total capacity was reduced in all groups but not in close relation to the number of segments removed. In all groups the average maximal breathing capacity and the per cent of rapid vital capacity expired in 1 second were unchanged postoperatively. The 7 minute alveolar nitrogen (breathing oxygen) was within or near normal limits in most cases before and after operation. The arterial oxygen saturation was normal in each case at rest and with mild exercises preoperatively and postoperatively.

Bronchospirometry, performed in 20 patients, showed that the over-all loss of function could be explained in most instances by unilateral changes.

Changes were similar in subjects more than or less than 40 years of age and in both sexes.

The reduction of pulmonary function is not greatly different after resection of one or several tuberculous pulmonary segments, suggesting that a minimal, rather uniform, amount of functioning lung is removed with the diseased tissue. Some possible variability related to the number of segments removed is probably masked by the "thoracotomy effect" described as following enucleation of small pulmonary nodules. However, there is a trend toward increasing reduction of pulmonary volumes, indicating that some sacrifice of ventilated lung is made. This trend is likely to be followed when a patient undergoes an additional resection.

Surgical Therapy for Chronic Nonspecific Pneumonitis. W. Ralph Deaton, Jr. *Ann. Int. M.*, 1958, 48: 1289.

The operative case histories of 6 patients with chronic nonspecific pneumonitis are presented. The disease process was generally characterized by a period of acute febrile illness followed by a chronic stage with productive cough and pleuritic pain. Hemoptysis may or may not occur. Pathology was usually confined to a single lobe exhibiting intralobular and interalveolar fibrosis, lymphoid and plasma cell hyperplasia, and suppuration and hemorrhage within the alveolar exudate. Areas of atelectasis were also present.

It is theorized that the disease may originate as a localized bronchitis or bronchiolitis with subsequent metaplasia and bronchiolar fibrosis. In the preantibiotic days the disease process progressed to bronchiectasis. Chronic pneumonitis, although nonspecific, should be regarded as a definite disease entity which requires differentiation from lung abscess or neoplasm. It can be diagnosed clinically and by roentgenography. Patients who fail to respond to conservative medical therapy or who show signs and symptoms of frequent recurrences should be subjected to pulmonary resection of the involved tissue.

—*B.G.P. Shafiroff M.D.*

Pulmonary Arteriovenous Fistulas (Les anévrysmes artério-veineux du poumon). P. Purriel and O. Muras. *J. fr. méd. chir. thorac.*, 1958, 12: 2.

The authors report 2 cases of arteriovenous fistula of the lung.

Their first patient was a 42 year old female who had noted clubbing of the fingers, cyanosis, and repeated epistaxis for several years. No history of similar symptoms in members of her family was obtained. During a previous pregnancy, she had suffered an episode of acute pulmonary edema. During the hospital work-up and shortly after the diagnosis of pulmonary arteriovenous fistula had been made by angiocardiogram, the patient died suddenly from a cerebral embolus. At autopsy the lesion was found in the right lower lobe without any segmental localization. The fistula was supplied by one afferent artery and two efferent veins.

The second patient was a 28 year old married female in whom a shadow in the right lung had been discovered 8 years previously and diagnosed as tuberculous granuloma. Her father had telangiectases on the lips and one sister suffered from recurrent epistaxis. Several months before the present work-up a sudden hemothorax had developed. During this episode, approximately 4 liters of hemorrhagic fluid had been withdrawn from the right side of her chest. No murmurs were audible over the right lung. Angiocardiography showed filling of the fistula, and of the afferent and efferent vessels. The fistula was located in the right upper lobe. At operation a segmental removal of the apical and anterior segments was performed. The patient left the hospital in good health. There was no evidence of multiple lesions in either of these patients.

Although both of these patients had isolated lesions, it is well known that pulmonary arteriovenous fistulas are very often multiple. The second patient was a good example of the well known fact that the pulmonary lesion is only one of the manifestations of Rendu-Osler's disease or hereditary hemorrhagic telangiectasias.

Upon reviewing the literature, the authors found that about 70 per cent of 102 reported cases of pulmonary arteriovenous fistula had multiple telangiectases and 50 per cent had histories of recurrent epistaxis. In 58 per cent of the patients there was a familial history of Rendu-Osler's disease. Goldman, Moyer and Ackerman, Sloan and Cooley, and other workers have reported the familial occurrence of pulmonary arteriovenous fistula. Although this condition is relatively rare, the authors underscore the fact that cases are being reported with greater frequency as the medical profession is becoming more familiar with the entity. From 1897, the year when the first case was reported, to 1944 there were only 15 case reports of pulmonary arteriovenous fistula. From 1950 to 1958 there were 58 cases reported. The cardinal symptoms of the lesion can be summarized by the following symptomatic triad: cyanosis, clubbing of the fingers, and polycythemia in the absence of cardiac disease. In about 70 per cent of the cases, a murmur may be audible over the lesion. The murmur is stronger during systole and during inspiration. The arterial blood will show varying degrees of oxygen desaturation. In cases in which the degree of right to left shunt has been calculated, values varying from 18 to 89 per cent have been found. The amount of blood shunted through the fistula gradually increases due to an increase in pulmonary arterial pressure. Lesions have the roentgenographic appearance of circumscribed masses, round or oval shaped, connected to the hilus by tortuous bands representing the branches of the pulmonary artery and veins running into the fistula. Angiocardiograms are essential for the diagnosis and often reveal the existence of multiple lesions.

The clinical course of patients with pulmonary arteriovenous fistula is frequently complicated by repeated hemoptyses which occur in about 50 per cent of the cases. The formation of thrombi in the fistula with cerebral emboli are also a frequent complication. Bacterial endarteritis in the fistula has also been reported by several authors. Seven cases of patients with pulmonary arteriovenous fistula who died of brain abscess have been reported. Another complication is that of duodenal ulcer, which Bockus attributes to the polycythemia.

Various procedures have been advised for the treatment of this lesion. Most often a lobectomy or segmental resection has been performed. Pneumonectomy is occasionally necessary. In several cases simple ligation of the vessels running to the fistula was done.

The authors consider that once a diagnosis of pulmonary arteriovenous fistula has been made, surgery should be formally advised because the chances of severe complication are high. The preferred method of treatment is excision of the lesion, by segmental resection or by lobectomy.

—*R. Menguy, M.D.*

Solitary Lung Cysts Lined by Bronchial Epithelium (Le cisti polmonari solitarie a rivestimento bronchiale). N. Masera, F. Viglione, and M. Gnavi. *Chir. torac.*, 1958, 11: 1.

The purpose of this study was to clarify the various etiologic factors underlying the group of pulmonary lesions known as bronchogenic cysts. The cases were selected from all the cases of cystic lesions of the lung in which the cyst was removed at the Institute of Surgery of the University of Turino in the period from 1950 to 1956.

The lesions were divided into 3 groups. In the first group there was no communication between the cyst and the bronchial tree and no associated bronchopulmonary disease. There were 11 patients in this group, 6 males and 5 females, most of whom were in their third or fourth decades. The symptomatology was that of pulmonary suppurative disease. The majority of the lesions were from 6 to 12 cm. in size. The cyst lining consisted of cylindrical epithelium, poor in mucus and ciliated cells, with elastic and smooth muscle fibers as well as cartilage in the wall.

The second group consisted of 3 cases in which the cystic lesion was associated with other pulmonary lesions of obvious congenital origin. In 2 patients the lesion was asymptomatic, in 2 cases there were anomalous arterial connections between the aorta and the lesion, and in one case a bronchogenic cyst situated in the mediastinum was associated with a bronchopulmonary sequestration.

In the third group (6 patients) were the lesions associated with acquired bronchopulmonary disease. Four patients had bronchiectasis and 2 had pulmonary tuberculosis. In all of the cases the cysts were surrounded by lung parenchyma that was altered by an old inflammatory process. This was suggestive although not formal proof of a relationship of cause and effect between the inflammatory pulmonary disease and the cystic lesions.

From the pathologic point of view the authors divide bronchogenic cysts into 3 types.

1. Bronchiectatic cysts in which the cyst wall is similar histologically to that of the bronchus in bronchiectasis.

2. "Bronchogenic", in which the tissue elements contained in the wall are the same as those in the normal bronchus but with an abnormal arrangement.

3. Cysts with a fibrous wall infiltrated by chronic inflammatory cells.

The roentgenologic diagnosis and surgical treatment are discussed. —*René Menguy, M.D.*

The So-Called Aspergillus (Das sogenannte Aspergillom). A. Brunner. *Schweiz. med. Wschr.*, 1958, 88: 559.

The author reports the history and the course of 6 cases of pulmonary infection with the Aspergillus organism. He points out that the differential diagnosis in many of these cases is between tuberculosis, tumor of the lung, occasionally angioma and any other entity creating a shadow on x-ray film. He points out that most of the patients who were cared for at the clinic in Zurich had a rather long history of general malaise and of hemoptysis.

In a recent work by Monod and Lo, in some 48 cases they found evidence of some early bronchiectasis or bronchiectatic infection associated with the Aspergillus organism. The author states that studies by Macaigne and Nicaud have indicated that pulmonary infection by the Aspergillus has been associated with surrounding, thrombosing endarteritis.

Studies in the Zurich Clinic have indicated that there is a rather low degree of general toxicity associated with this type of infection. Most Aspergillus infections are found in the upper lobe of the lung.

In 5 of the 6 cases reported by Brunner the upper lobe infection was predominant. He believes that Aspergillus infections begin in a solitary cyst in the lung, and that secondary infection does not commonly occur in this association. The observation of the clinic has been that the roentgenologic findings usually present one outstanding difference from those of the usual tumor angioma or other infections such as tuberculosis. A thin line, or crescent shadow of air, found at the upper pole of the usual round or oval density should strongly suggest the possibility that the patient has infection with Aspergillus.

It has been the general finding in this series of cases that the preferable method of treatment is pulmonary resection. Results have routinely been good, without evidence of recurrence in these patients.

—*Walter L. Byers, M.D.*

A Correlated Histological, Cytological, and Cytochemical Study of the Tracheobronchial Tree and Lungs of Mice Exposed to Cigarette Smoke. CECILIE LEUCHTENBERGER, RUDOLF LEUCHTENBERGER, and PAUL F. DOOLIN. *Cancer*, 1958, 11: 490.

A CAREFULLY CONTROLLED STUDY of changes in the tracheobronchial tree of mice exposed to cigarette smoke was carried out at the Institute of Pathology of Western Reserve University. The histologic alterations varied from minimal or slight bronchitis to a marked bronchitis with atypical proliferative changes in the lining epithelium. These changes in many respects were consistent with dysplasia or with carcinoma in situ and were similar to the epithelial lesions of human cigarette smokers. Cytochemical changes generally preceded the histologic changes and consisted in an increase in nuclear volume, tyrosine, dry mass, and desoxyribose nucleic acid content. The changes were multicentric and one or more could be seen in different areas of the same bronchus. They were more common in the distal portion of the bronchus adjacent to the lung. The question of whether the advanced atypical hyperplasias seen in these animals represent a reversible lesion, a permanent but non-neoplastic change, or early carcinoma must await the study of animals following longer survival periods.

—*Harvey W. Baker, M.D.*

Suspected Bronchogenic Carcinoma (Verdacht auf Lungenkarzinom). H. BIRKHÄUSER. *Schweiz. med. Wschr.*, 1958, 88: 500.

WITH THE increasing use of mass survey films, more and more silent bronchogenic malignancies are being discovered. These are the cases which are most promising regarding a definitive cure. On the other hand, these are the cases which present diagnostic problems and challenges. The importance of keeping the possibility of a malignant lesion always in mind cannot be overemphasized.

Seventeen such cases are presented in the article. All of them challenged the diagnostic acumen of the attending physicians. The following hints for better diagnostic success evolve from these case reports:

1. Recurrent or nonresolving segmental pneumonitis in elderly males should always be suspected as having a malignant basis.

2. Negative bronchoscopic, bronchographic, and cytological findings do not rule out bronchogenic carcinoma.

3. The presence of suspicious symptoms (chronic cough, weight-loss) with absent x-ray findings in posterior and anterior films necessitates the obtaining of a lateral film. It frequently will reveal a small lesion, especially if it is located posteromedially in the chest cavity. Also the swallowing of barium is sometimes of value.

4. The presence of tuberculosis-positive sputum should never rule out the possibility of malignancy. Laboratory error or tumor coincidental with tuberculosis should always be considered in such cases. Periodic films in cases of old tuberculous lesions should offer a clue concerning development of a malignant focus. A negative Mantoux test is tremendously helpful in these cases.

5. A simple and often helpful diagnostic measure is lymph node biopsy, especially biopsy of the prescalene fatpad.

6. If at all possible, exploratory thoracotomy is recommended in every case in which a definitive diagnosis cannot be made by any other means.

—*Gunars Medins, M.D.*

Some Possible Exogenous Factors in the Causation of Lung Cancer. ERNEST KENNAWAY and A. J. LINDSAY. *Brit. M. Bull.*, 1958, 14: 124.

THE AUTHORS, pathologist at St. Bartholomew's Hospital and chemist at Sir John Cass College, London, reviewed some possible exogenous factors in the causation of lung cancer. They found no evidence that external radiation with roentgen or gamma rays has caused lung cancer in man.

Complete tables were included, listing the chemical constituents of tobacco and tobacco smoke. The authors stressed that the three types of smoking (cigarette, cigar, and pipe) involved differences, especially in (1) the nature of the tobacco smoked and the method by which it was cured; (2) the temperatures produced, and the conditions for oxidation in smoking; (3) the filtration of the smoke through unsmoked material (and through the lumen of the pipe); (4) the relation between the amounts of hydrocarbons produced by pyrolysis and destroyed by combustion; (5) the amounts of hydrocarbon already present in the unsmoked material; and (6) the practice of inhalation.

The larger amounts of 3:4-benzopyrene in the smoke of cigars and pipes are of interest in connection with the much lower incidence of cancer of the lung among those who smoke tobacco in these forms. Factors which may be considered are: (1) the alkaline smoke of cigars and pipes, unlike the acid smoke of cigarettes, is not inhaled; (2) the temperatures reached in cigarettes are higher than those attained in cigars and pipes, and the conditions are more favorable for oxidation; and (3) there appear to be no data as yet about the comparative sizes of the particles or droplets in such smokes, upon which their penetration into the air passages may depend.

That the increase of lung cancer in recent years is of occupational or industrial origin was shown to be extremely unlikely 10 years ago by Kennaway who found that the number of deaths in two large groups (coal miners and agricultural workers) in which the incidence of lung cancer was very low, was increasing at the same rate as in the general population of England and Wales.

Kennaway and Lindsay warn that any estimate of the total intake by man of any constituent common to coal smoke and to cigarette smoke (arsenic, 3:4-benzopyrene) is misleading in relation to the etiology of cancer of the lung since tobacco smoke reaches the respiratory tract solely through the mouth, whereas most of the air we inspire passes through the very efficient nasal filter which arrests 80 per cent of particles larger than 2.5 micra.

The authors conclude that there is a real need for fuller chemical investigation of tobacco, tobacco smoke, and town air in order properly to evaluate these exogenous factors in the causation of lung cancer. —*Gilbert S. Campbell, M.D.*

Preoperative Evaluation of Patients with Clinically Resectable Bronchogenic Carcinoma. THOMAS W. SHIELDS and EVERETT SHOCKET. *Arch. Surg.*, 1958, 76: 707.

THE PROGNOSIS for bronchogenic carcinoma is distressingly poor for long term survival. The influence on the ultimate fate of the patient of the cellular type, the extent of local disease, and the presence, or absence, of lymphatic and blood-borne metastases at the time of diagnosis has been well documented. The biological behavior of the tumor and the host-tumor relationship are undoubtedly of great importance in determining the eventual outcome also. When the disease is confined to the lung, and occasionally to the adjacent mediastinal nodes, surgical excision of the involved lung and its lymphatic drainage area is accepted as the treatment of choice and is believed to give a better prognosis for long term survival. However, if the disease has spread beyond the confines of the surgical excision, the removal of the primary growth is of little avail, although occasionally it may be beneficial as a palliative measure. One of the aims of the preoperative evaluation of the patient with bronchogenic carcinoma should be to exclude the cases in which a pulmonary resection would be of no benefit.

Biopsy of the scalene lymph nodes has been advocated as an additional step in an attempt to fulfill this aim. The lymphatic drainage of the lungs and mediastinum is such that the deep supraclavicular lymph nodes (scalene nodes) may become involved by the disease process arising in the thorax. When the nodes are palpable, there is no question that an excisional biopsy is indicated. When the nodes are not palpable, however, the question arises as to the value of routine biopsy in a case of clinically resectable carcinoma of the lung. To formulate an answer to this question, the authors reviewed the records of 97 patients who had had a biopsy of nonpalpable scalene lymph nodes. Of these 97 patients, 47 were found to be suitable for inclusion in this study. The criteria for selection were that the diagnosis of carcinoma of the lung must be confirmed histologically either before or after thoracic exploration, and secondly, that the lesion be regarded as clinically resectable. The 47 scalene node biopsies were done between May, 1954 and September, 1957.

The technique and selection of the side of the biopsy are discussed in detail.

In this series of patients with clinically resectable carcinoma of the lung, 47 had excision of nonpalpable scalene nodes. Of these 47 biopsies, 32 were done on the right side, 13 were done on the left, and 2 were done bilaterally. The authors suggest a right-sided biopsy when the lesion is on the right, a left-sided biopsy when the tumor is in the upper third of the left lung, and bilateral biopsy whenever the lesion is elsewhere in the lung. Lymph nodes were present in all specimens resected and the number varied from 2 to 12, the average being approximately 5 nodes per specimen. Histologic examination revealed metastatic tumor to be present in the nodes of 3 patients of the group. Thus, the biopsy of nonpalpable scalene nodes revealed the presence of metastatic disease in 6.3 per cent.

The authors also reviewed the chest roentgenograms of these patients and arbitrarily separated the patients into three categories. Group A consisted of 6 patients in whom the finding was that of a predominant hilar mass with or without infiltration into the pulmonary parenchyma. Group B was made up of 23 patients in whom the finding was that of bronchial obstruction with or without secondary infection, the lesion being main stem, lobar, or segmental in location. Group C was composed of 18 patients with peripheral pulmonary lesions. All three positive scalene node biopsies were obtained in Group A, those with a predominant hilar mass.

Location of the carcinoma was determined by bronchoscopy, x-ray, and examination of the lung. Thirty of the carcinomas arose in the right lung, and of these, 13 were in the upper lobe, 2 in the middle lobe, and 13 in the lower, and the remaining 2 arose from the hilar region. Seventeen of the carcinomas arose from the left lung; 11 originated in the upper lobe and 6 in the lower lobe. The two positive right scalene node biopsies were taken from the 2 patients with tumors that could only be localized to the right lung in the hilar area. The positive left scalene node biopsy was obtained from a patient with a lesion in the lower-lobe bronchus but with an associated prominent hilar mass and infiltration into the left upper lobe.

The cellular pattern of the tumors has been classified into four types. There were 16 moderately or well-differentiated epidermoid and 14 poorly differentiated epidermoid carcinomas. Fourteen were classified as undifferentiated-cell carcinomas. The remaining three were adenocarcinomas. Two of the positive scalene node biopsies were in the undifferentiated group, and the third was in a patient with a poorly differentiated epidermoid carcinoma.

Of the 47 patients studied, bronchoscopy was done in 42. The bronchoscopic biopsy was positive in 46.8 per cent of the entire group. The cytologic smear of bronchoscopic aspiration material was positive or highly suggestive of tumor cells in 25 patients. Com-

bining all three diagnostic methods, bronchial biopsy, cytologic smear, and scalene node biopsy, a positive diagnosis was established in 30 (63.7 per cent) of the 47 patients. In the remaining 17 (36.3 per cent), the diagnosis was made from tissue obtained at the time of operation. It was interesting to note that of the group whose roentgenograms revealed a prominent hilar mass, the diagnosis was established by one of the diagnostic methods in all cases. In those with bronchial obstruction the diagnosis was made preoperatively in all but 2 cases, but in the peripheral group of lesions the diagnosis was established prior to surgery in only 3 of the 18 patients, and in each instance this was by positive cytologic smear.

Of the 47 patients who were originally thought to have clinically resectable lesions, the scalene node biopsy revealed metastatic carcinoma in 3, and no surgical therapy was offered to these patients. Surgery was not offered to 4 other patients, because of extremely poor pulmonary function in 2, an acute coronary infarction in 1, and heart failure with an old cerebral vascular accident in the fourth. Three patients refused surgical intervention. All 10 patients received roentgen therapy. Thirty-seven patients had exploratory operations. In 13 patients (35.1 per cent) the lesion was deemed nonresectable because of advanced local spread or extensive mediastinal lymph node involvement. Twenty-four resections (64.9 per cent) were performed. There were 14 pneumonectomies, 9 lobectomies, and one wedge resection. In the group with resection, mediastinal, hilar, or peribronchial lymph node involvement was found in 10.

The authors conclude that the procedure of scalene node biopsy does not have a sufficiently high positive yield to justify its routine use in all clinically resectable cases of carcinoma of the lung. They do suggest, however, that it be employed preoperatively in those cases in which a prominent "hilar mass" is found on the chest roentgenogram, or examination of the bronchoscopic biopsy tissue or cytologic smear reveals the presence of an undifferentiated-cell carcinoma.

—*Donald M. Clough, M.D.*

HEART AND PERICARDIUM

Aortic Stenosis of No Physiologic Significance. Ernest W. Hancock, William M. Madison, Jr., Munro H. Proctor, Walter H. Abelmann, and George W. B. Starkey. *N. England J. M.*, 1958, 258: 305.

The clinical diagnosis of aortic stenosis remains difficult and the classic picture is present only in a minority of cases. Too strict a set of criteria for diagnosis may cause the diagnosis to be overlooked. Postmortem studies have indicated that severe aortic stenosis may be present without any murmur, or in association with a wide pulse pressure or a considerable degree of hypertension. The minimal criteria for diagnosis have not yet been established. At present aortic stenosis is properly suspected in many patients who show only one or two of the classic features. In these cases, serious diagnostic uncertainties may arise.

The quantitative assessment of aortic stenosis is now possible by catheterization of the left side of the heart. Any physiologically significant stenosis causes a higher systolic pressure in the left ventricle than in the aorta and simultaneous determination of the systolic pressures in the left ventricle and systemic artery and of the cardiac output allows one to calculate the size of the aortic valve orifice.

This procedure has accurately predicted severe degrees of aortic stenosis subsequently demonstrated at operation; it has also served to identify certain patients with mild or negligible degrees of aortic stenosis who have appeared from clinical evidence alone to have enough stenosis to warrant a surgical approach. Such patients may indeed have some aortic valve abnormality but without significant narrowing of the valve. Their cardiac symptoms are due to other cardiac lesions, particularly coronary artery disease, with myocardial fibrosis or infarction, or sometimes mitral valve disease, the clinical evidence of which may be very equivocal.

The authors report the cases of 7 patients of this type encountered during the course of one year. All had sufficiently good clinical evidence for aortic stenosis and sufficiently severe cardiac symptoms for aortic valve surgery to be seriously considered. On the other hand, none of these patients had all the classic signs of aortic stenosis and each was atypical in one or more aspects. Significant aortic stenosis was subsequently ruled out in each patient: in 5 by catheterization of the left side of the heart, with demonstration of no measurable systolic pressure gradient across the aortic valve; and in 2 by autopsy, with demonstration of an aortic valve orifice not significantly narrowed.

The authors conclude that aortic stenosis and chronic coronary artery disease may cause very similar clinical syndromes of cardiac disease. Functionally insignificant pathologic changes in the aortic valve may produce clinical signs indistinguishable from those produced by severe aortic stenosis. Thus, patients with signs and symptoms suggestive of severe aortic stenosis may in fact be suffering predominantly from coronary artery disease. The presence or absence of significant aortic stenosis is objectively established by the findings of catheterization of the left side of the heart. This procedure is indicated whenever surgery for aortic stenosis is under consideration and there is uncertainty about the degree of aortic stenosis present. —*David E. Hallstrand, M.D.*

Isolated Aortic Stenosis; The Late Prognosis. Knud H. Olesen and Erik Warburg. *Acta med. scand.*, 1958, 160: 437.

The authors made a detailed study of 42 cases of isolated aortic stenosis. In reviewing the 18 cases studied post mortem, they determined that if the diagnosis of aortic stenosis depended on the classical combination of systolic murmur over the aorta, aortic thrill, faint or absent second aortic sound, and anacrotic pulse, only 3 of the 18 would have been properly diagnosed. They state that an acceptable diagnostic criterion would be a loud and rough aortic systolic murmur associated with one or more of the following three signs:

1. Roentgenologic enlargement of the heart.
2. Isoelectric or negative T_1.
3. Left axis deviation.

The 42 patients were followed up and at the time of review, 39 had died and 3 were still surviving. The

average age at death was 55.5 years, a slightly higher age than that of patients with isolated mitral stenosis and combined mitral aortic defects. Angina pectoris and syncope constitute a warning signal of a shorter survival time. The causes of death were incidental disease (2); subacute bacterial endocarditis (1); syncope with fracture of the cervical vertebrae (3); and heart failure (29). There were 6 sudden deaths.

The authors conclude that this is an extremely serious medical entity and if aortic valvular surgery develops into a reasonably safe and effective procedure, this type of patient should be evaluated for surgery. —*Ward D. O'Sullivan, M.D.*

Direct Left Ventricular Puncture in the Evaluation of Aortic and Mitral Stenosis. PAUL N. YU, FRANK W. LOVEJOY, JR., BERNARD F. SCHREINER, ROBERT H. LEAHY, and Others. *Am. Heart J.*, 1958, 55: 926.

THE AUTHORS present, with many tables, a detailed study of the blood flow; pressures, resistances, stroke work against pressure, and valve area resulting from simultaneous pulmonary artery catheterization, peripheral artery catheterization, and left ventricular catheterization in 30 patients with various types of cardiovascular disease. The technique of left ventricular puncture is slightly modified from that of Brock and his associates. The authors believe that if the apical impulse is identifiable the needle can be accurately introduced into the cavity of the left ventricle. Although the authors take the precaution of having an anesthesiologist and a thoracic surgeon in attendance during the catheterization, they have not encountered any difficulties. They believe that puncture of the left ventricle through the anterior chest wall is simple and useful; it causes no significant hemodynamic alterations and so far has not been followed by serious complications.

—*Ward D. O'Sullivan, M.D.*

Congenital Aorticopulmonary Fistula. J. SKALL-JENSEN. *Acta med. scand.*, 1958, 160: 221.

A COMMUNICATION between the ascending aorta and the pulmonary artery above the level of the semilunar valves is labeled aorticopulmonary fistula or aortic septal defect. Because the disorder has been detected during attempted operations for patent ductus arteriosus and because the fistula can be closed surgically increased interest in the abnormality is justified. In a review of the literature the author found that operation has been attempted in 16 cases and was successfully accomplished in 8; a partial closure resulted in 2 and death occurred in 6 patients. Thirty-eight cases are available for study in the literature, in which the diagnosis of congenital aorticopulmonary fistula was made during life.

Of the 2 cases reported by the author the first was a boy of 7 years in whom the diagnosis was made by cardiac catheterization studies. The catheter was passed without difficulty from the pulmonary artery into the aorta and roentgenograms taken in oblique projections definitely showed the catheter from the pulmonary artery had entered the ascending aorta. the course thus being quite different from that seen in patent ductus arteriosus. There was equalization of pressures between the aorta and pulmonary artery. The septal defect was closed with two rows of mattress sutures. The patient died 22 hours postoperatively. Autopsy revealed that death was due to hemorrhage caused by a suture which had cut through the tissue. The second patient, a girl of 4 months, was admitted because of underdevelopment and intense dyspnea but she had no cyanosis after crying. Cardiac catheterization did not demonstrate a communication but angiocardiography showed inflow through a wide communication from the ascending aorta to the main stem of the pulmonary artery. The fistula was closed rather than divided with suture ligatures. The postoperative course was uneventful. Eleven months after operation the patient was well.

Aorticopulmonary fistula is a rare anomaly having been demonstrated in only 2 patients among 275 seen with congenital heart disease. It has been demonstrated equally frequently in both sexes and in children of all ages. Less than one-fifth of the patients are more than 15 years of age and none more than 30. In spite of variations in the size of the fistula the clinical picture is quite uniform. The patients have cardiac complaints, most commonly dominated by dyspnea on exertion, and respiratory tract infections are frequently encountered. One-third of the patients had some degree of cyanosis but only in some of these could it be explained by the presence of an arteriovenous shunt. A cardiac murmur was present in all patients and this was usually loud and maximal in the upper precordial area. It was a continuous systolic, or systolic diastolic murmur. The electrocardiogram was normal in only one-third of patients, the most frequent finding being that of right ventricular strain. The roentgenogram revealed a large heart with the presence of wide and sometimes briskly pulsating pulmonary arteries.

The present survey does not give information as to prognosis of the aorticopulmonary fistula, but the highly uniform hemodynamic conditions suggest that the outlook for these patients is about the same as on patent ductus arteriosus with pulmonary hypertension and in Eisenmenger's syndrome. Thus, the prognosis is more serious than the average case of patent ductus arteriosus. Surgical treatment is indicated whenever possible. —*Allan D. Callow, M.D.*

Five Cases of Congenital Aneurysm of the Aortic Sinuses (of Valsalva) and Notes on the Prognosis. H. GÖSTA DAVIDSEN, JØRGEN FABRICIUS, and BRIK HUSFELDT. *Acta med. scand.*, 1958, 160: 455.

FIVE CASES of congenital aneurysm of the aortic sinuses of Valsalva are reported. The classification as congenital aneurysm is based on the absence of syphilis, arteriosclerosis, or bacterial endocarditis. The clinical history of each case is presented in detail. In one case in which the aneurysm of the right coronary sinus had ruptured into the right atrium there was severe failure of the right side of the heart and an attempt was made to correct this lesion surgically. Cardiac arrest occurred during the preliminary dissection and the patient expired. In addition to their own 5 cases, the authors review 17 cases which they abstracted from the literature with enough detail to make their evaluation meaningful.

—*Ward D. O'Sullivan, M.D.*

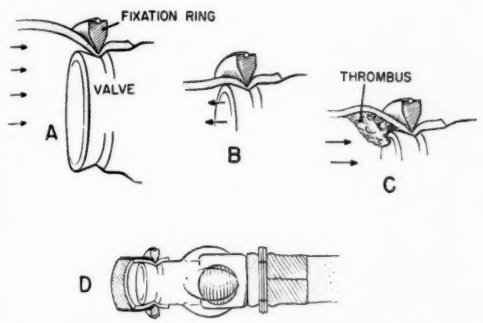


FIG. 1 (Hufnagel *et al.*) *A*, The aortic wall is elevated from the end of the prosthesis by systolic expansion. *B*, In diastole the aorta again controls the end of the valve but may leave a small amount of blood cul-de-sac. *C*, Thrombus formation may extend over edge of valve. *D*. The aortic wall is compressed against the prosthesis by wrapping with orlon mesh. This eliminates the potential cul-de-sac and subsequent thrombus formation. (Courtesy of J. B. Lippincott Co.)

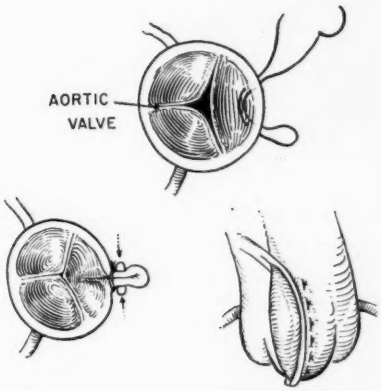


FIG. 2. Plastic reconstruction of aortic valve used when valve itself is relatively normal but the valve ring is dilated. Decreasing the circumference at the level of the cusp of the noncoronary sinus permits the leaflet to close by decreasing cross-sectional area at valve level.

Experiences with New Types of Aortic Valvular Prostheses. CHARLES A. HUFNAGEL, PAULO DIAZ VILLEGAS, and HECTOR NAHAS. *Ann. Surg.*, 1958, 147: 636.

TWO MODIFICATIONS of the ball valve type prosthesis have extended its usefulness and increased its safety. A special type plexiglas housing with a silicone rubber ball has so reduced the sound of the opening and closing of the valve that it is no longer audible. Fixation of the prosthesis using the principle of multiple point fixation prevents necrosis of the arterial wall; but unless the prosthesis fits the aorta very accurately, the aortic wall moves away from the valve when systolic expansion of the aorta occurs. A potential cul-de-sac is thus formed, and eventually clot may build up in this space with subsequent embolization. This possibility is prevented by wrapping the aorta with semi-elastic orlon mesh which fits snugly at the point of fixation, and compresses the aorta against the intravascular part of the prosthesis (Fig. 1).

A number of methods have been tried experimentally to place a valve prosthesis in the normal aortic position. One technique uses a modified ball valve prosthesis fixed below the coronary orifices. The walls of the prosthetic chamber are removed in three areas in order that blood may flow into the coronary arteries. The size of ball in this prosthesis necessary to give complete occlusion offers significantly increased resistance to flow.

Various cusp types of valve prosthesis have been developed. Currently silicone rubber is being used experimentally and gives promise of performing well after long term implantation. It has performed well experimentally for a period of six months.

A helical coil spring which opens by elongation and closes by shortening is also being investigated. The closed position is the normal situation and it resumes this position as soon as systolic flow ceases. The open position offers very little resistance to flow and the resistance of the spring to the opening pressure is very light. The illustrated valve is constructed of teflon, and may be held in a subcoronary position either by the suture method with open operation or by multiple point fixation. These valves have been used successfully experimentally for periods of three months.

In those cases in which there is either dilatation of the aortic valvular ring or shrinkage of a cusp, a reconstructive procedure has been devised to avoid use of an artificial implant. Under direct vision, the noncoronary bearing cusp is retracted anteriorly and a suture at the base of the cusp narrows the area between the commissures of the posterior cusp. A row of similar sutures is then placed upward to above the level of the insertion of the cusps (Fig. 2).

—*E. Thomas Boles, Jr., M.D.*

Surgical Technique for Repair of High Ventricular Septal Defects. JOHN W. KIRKLIN and DWIGHT C. MCGOON. *J. Thorac. Surg.*, 1958, 35: 584.

HIGH VENTRICULAR SEPTAL DEFECTS comprise approximately 90 per cent of the ventricular septal defects for which operation is undertaken. From the left ventricle the defect would appear as an opening that usually equals or exceeds the aortic orifice in diameter, and most often is immediately inferior to the right aortic cusp, the adjacent portion of the posterior aortic cusp, and the intervening commissure, with no superior remnant of ventricular septum below the aortic ring itself. Put simply, the upper margin consists of the aortic ring and the lower margin of ventricular septum. Difficulty of approach from the side, however, requires working through the right ventricle despite the inconvenience of adjacent structures, the crista supraventricularis, tricuspid valve, and papillary muscle of the conus, which are in the way. An important orientation point is a central fibrous body (or fibrous trigone) to which the aortic-valve ring is firmly attached on the left side, and the tricuspid-

valve ring on the right. After approach via right ventriculotomy, however, one still must orient his work with relation to the left ventricular structures.

Under conditions of whole-body perfusion and cardiac arrest, the defect may be closed directly—as most are—or by a prosthesis. Direct closure must leave no undue tension, as that permits disruption of the repair. Usually the defects are ovoid, and the line of repair must be parallel to the long axis of the oval, which ordinarily is parallel to the aortic ring and transverse to the outflow tract of the left ventricle. The first suture must be placed in the angle to the viewer's right, as this site will become quite inaccessible after suturing has been begun elsewhere. The first stitch is placed left-to-right through the septum at its junction with the central fibrous body and tricuspid ring, and right-to-left through the fibrous tissue at the junction of aortic-valve ring with tricuspid-valve ring. Grasping tissue at each extremity of the central fibrous body, and tied with just sufficient tension to approximate the tissues snugly, this is the key suture. Further interrupted sutures are placed similarly every 2 to 3 mm. with knots in the left ventricle, use of this left-sided technique being continued for the sake of working room and left ventricular orientation until the defect is so nearly closed that the knots must be in the right ventricle. As the final sutures are placed, the left ventricle is filled with blood, expelling residual air.

The prosthesis, if one is used, is made of polyvinyl sponge, compressed in thickness to 3 mm. from 12, and slightly smaller than the defect itself. The first suture, which of course fastens prosthesis to tissue, is placed at the same point as in the direct repair. Hinged on the first stitches, the prosthesis is swung toward the right to keep the defect open for the left-sided technique as described above until stitches along its superior and inferior edges force the prosthesis to close. The technique of the remainder of the operation corresponds to that in the direct method.

Modern Trends in the Surgical Treatment of Constrictive Pericarditis (Moderni orientamenti di tecnica operatoria nella pericardite costrittiva). A. Gamba and A. E. Vaccato. *Acta chir. ital.*, 1958, 14: 149.

The authors review a series of cases of constrictive pericarditis treated in their clinic in the period from 1940 to 1957. They are particularly interested in the successive changes in the surgical approach to the problem.

Their series consisted of 40 patients. Five patients were treated by a simple precordial thoracotomy following the method of Brauer; none of these received any benefit. Of the 5 patients that had an extrapleural pericardectomy, 2 died of subsequent recurrence. In 11 patients a transthoracic approach was used, 9 times through the left chest and twice through the right side. The immediate results were good in 10 patients. Of the latter, 2 died subsequently of a recurrence. The surgical results became considerably better with the adoption of the transsternal approach via a median sternotomy. Among 7 patients operated on by this approach, there were 5 good long term results.

Since 1955 the authors have used the bilateral transverse thoracotomy described by Johnson and Kirby with excellent results. They consider this approach to be the one of choice for the following reasons: the exposure is excellent and enables the surgeon to work on both ventricles and around the vena cava; postoperatively the incision heals very well and is less painful than the vertical incision. The authors stress the following surgical principles in the treatment of constrictive pericarditis:

Pericardectomy should be performed before the onset of irreversible myocardial damage.

The surgical results are proportional to the recuperative potential of the myocardium.

With modern chemotherapy, surgery before the etiologic process has burned out is possible.

The pericardectomy should be as extensive as possible, otherwise relapses can be expected.

The bilateral thoracotomy is the best approach.

—*René Menguy, M.D.*

Maximal Reconstitution of the Stenotic Mitral Valve by Neostrophingic Mobilization; Rehinging of the Septal Leaflet. Charles P. Bailey and Teruo Hirose. *J. Thorac. Surg.*, 1958, 35: 559.

The authors state that commissurotomy for mitral stenosis is in many respects a disappointing procedure for the following reasons:

1. Because of technical and conceptual limitations, the extent of the commissurotomy usually amounted to but 20 to 30 per cent of the ideal. This was attested by auscultatory manifestations after surgery as well as by physiologic evidences of residual obstruction. In many, this residual stenosis was reinforced and aggravated by an element of subvalvular stenosis which was usually unrecognized (now believed to be present in more than half of the patients).

2. The inadvertent production of significant mitral regurgitation.

3. Unsatisfactory clinical course of patients who have had commissurotomy. While 75 per cent received significant benefit many patients merely received a prolongation of a life of invalidism.

4. The increasing evidence of restenosis in 20 to 40 per cent of the patients who were operated upon with the old technique.

5. An apparently irreducible incidence of arterial embolization due chiefly to dislodgment of thrombotic fragments from a clotted left auricular appendage.

A new surgical technique, neostrophingic mobilization, is described which changes the "flutter-valve" action of the normal bicuspid mitral valve to a "flap-valve" action of the then nearly unicuspid mitral valve. While such modified valve action is not entirely normal to the human being, nevertheless it is an efficient functional mechanism. The authors believe it can be established by surgery in most patients with mitral stenosis, while a normally functioning "flutter-valve" can be restored but rarely.

There were 227 consecutive patients operated upon for essentially isolated mitral stenosis since the deliberate application of this new technique in September, 1956. A completely satisfactory mobilization was accomplished in only 70 per cent. In 20 per cent, the technical achievement (although less than desired) was considered to be equal or superior to that which would have been produced by the older technique of commissurotomy. In most instances the

failure was due to incomplete mobilization because of the beginning development of a regurgitant jet. Regurgitation of greater than 1+ degree was created in 19 patients. However, 76 patients manifested a new systolic murmur postoperatively.

Calcification of the valve of severe degree was present in 34 instances but did not seriously reduce the surgeon's ability to achieve a satisfactory mobilization. Subvalvular pathologic change was found in 128 patients and in 70 direct papillary muscle adherence to the valve apex was recognized at one or both poles. Complete relief of the subvalvular stenosis was not accomplished in 20 cases. Arterial embolization was produced at operation in 7 patients.

The flap-valve mechanism effect is accomplished by a rehinging of the septal cusp not only through its flexible midzonal tissue but also with respect to the usually shortened papillary suspension yoke which must be split longitudinally. It cannot routinely be accomplished except from the right sided approach. Because of certain unavoidable handicaps during attempts to carry out an extensive mobilization of the valve structures with maintenance of full competence when the open technique is employed, the authors believe that a better and safer reconstitution of the stenotic mitral valve can be achieved by the closed method. —*David E. Hallstrand, M.D.*

Ventricular Aneurysm After Myocardial Infarction; Surgical Excision with Use of Temporary Cardiopulmonary Bypass. DENTON A. COOLEY, HAROLD A. COLLINS, GEORGE C. MORRIS JR., and DON W. CHAPMAN. *J. Am. M. Ass.*, 1958, 167: 557.

THIS ARTICLE describes 2 cases in which aneurysmectomy and ventricular repair were performed successfully with the use of temporary cardiopulmonary bypass.

One of the more lethal complications of myocardial infarction is ventricular aneurysmal formation. It may affect from 10 to 38 per cent of patients surviving myocardial infarction. It may occur in the first few days after infarction, but usually develops several months later. Its presence is suspected when a noncontractile sac with pulsations paradoxical to those of the rest of the left ventricle is seen fluoroscopically.

A 50 year old man was admitted to the hospital with a history of myocardial infarction 3 months prior to admission. During the month prior to admission he had had mild exertional dyspnea, orthopnea, and occasional paroxysmal nocturnal dyspnea. His blood pressure was 120/90, in contrast to 170/100 prior to the heart attack. The electrocardiogram revealed extensive infarction of the anterior wall with persistent ST segment changes in precordial leads. Thoracic roentgenograms revealed an enlarged left ventricle with a bulbous apex suggestive of cardiac aneurysm. At fluoroscopy the aneurysm pulsated paradoxically to the left ventricular pulsations. At operation temporary cardiopulmonary bypass was established, blood being drawn from the superior and inferior venae cavae by a single catheter from the common femoral vein and introducing it via the common femoral artery. The aneurysmal wall measured 3 mm. in thickness. The sac was completely excised back to normal myocardial muscle, and the ventricular suture line was 10 cm. long. The postoperative course was complicated with fever and mental disorientation in the first 3 days; thereafter it was uneventful and the patient was dismissed 18 days after operation. Physical activity has progressively increased.

A second patient had subsequently been successfully operated upon for massive left ventricular aneurysm. Preoperative and postoperative cardiac catheterization data suggest improved cardiac function with relief of stasis on the left side.

According to certain medical reports, only 12 per cent of patients survive more than 5 years after the formation of a ventricular aneurysm. Congestive failure, rupture of the aneurysm, and embolic phenomena account for most of the deaths. The authors believe that surgical excision of the sac should be considered in cases with ventricular aneurysm, especially if cardiac function is impaired.

—*Stephen W. Carveth, M.D.*

Maintenance of Patency of Carotid Arteries Implanted into the Myocardium. MARVIN H. NACHLAS, MYRON J. MYERS, ROBERT D. SOLOMON, ALMA B. KELLY, and ARNOLD M. SELIGMAN. *J. Thorac. Surg.*, 1958, 35: 706.

VINEBERG showed that by placing the left internal mammary artery into a myocardial tunnel, the implanted vessel remained patent and developed arterial connections with the coronary vascular system, thus furnishing an extracardiac source of blood to the myocardium. Moreover, this extracardiac arterial blood was capable of protecting the heart muscle against both the mortal and morbid effects of coronary artery occlusion in experimental animals and in man. This procedure has not attained widespread acceptance for, in the hands of other investigators the results were not the same as his.

Because of the contradictory nature of the reports, and because the concept of arterial implantation to the myocardium appeared to be a biologic phenomenon sufficiently unique and important to merit careful investigation, the authors began to evaluate the procedure 3 years ago. The early results revealed that in 25 young pigs and in 19 dogs, the lumen of the implanted internal mammary artery became obliterated within 4 weeks in all but one animal of each species. The present article presents the experiments which were carried out in an effort to understand the cause of the intimal proliferation and the consequent obliteration of the artery which had been implanted into the myocardium.

The implantation of the left carotid artery in the myocardium of dogs by the standard technique resulted in intimal proliferation of the lumen in 89 per cent of the animals by the end of one month. By modifying the procedure so that the distal open end of the implanted artery is placed in the right ventricular cavity, the lumens of 100 per cent of the implanted vessels remained patent, some for as long as 10 months. The trauma to the implanted artery which results from the repeated myocardial contraction was not responsible for the intimal proliferation. It is thought that the continuation of blood flow through

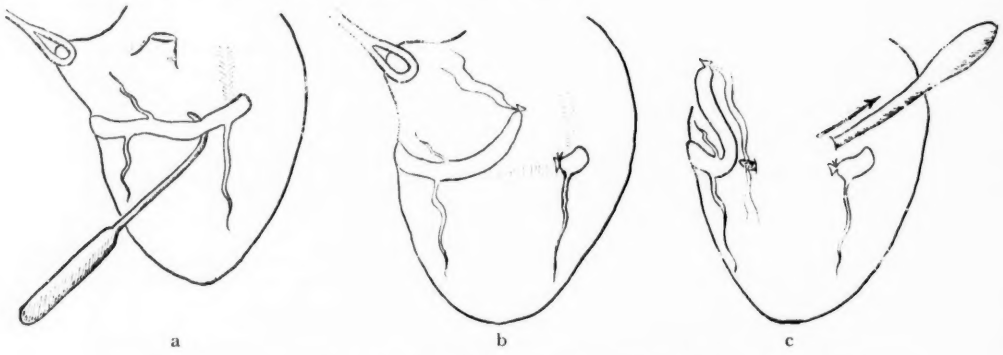


FIG. 1. (Hernandez-Lopez). a, Liberation of the coronary sinus. b, Division of the sinus between two ligatures. c, Needle passing through the auricle with the suture pulling the sinus.

the vessel is the most important factor in the maintenance of patency. The amount of flow necessary is still not known.

The chances for the development of anastomoses between the implanted artery and the coronary arteries appears to be improved in the ischemic heart muscle. However, the demonstration of the presence of anastomotic connections does not indicate that a significant amount of blood is being delivered to the myocardium. —*Stephen A. Zieman, M.D.*

A New Technique for Revascularization of the Heart in Obstruction of the Coronary Arteries; Sinistration of the Coronary Sinus (Una nueva tecnica de revascularizacion del corazon en la obstruccion de las arterias coronarias; sinistración del seno coronario). E. HERNÁNDEZ-LÓPEZ. *Cir. gin. urol.*, 1957, 11: 425.

THE VARIOUS SURGICAL METHODS devised to correct deficient myocardial circulation are reviewed and their disadvantages cited, including those of the Beck II operation. It occurred to the author that results might be improved by establishing a communication with the coronary sinus not via the aorta, but directly with the left heart. This is possible because the sinus in its course encounters the left auriculoventricular groove along the left and posterior surface of the heart. The sinus may be isolated and divided between two ligatures at its entry into the left auricle, the distal end being inserted through an incision in the left heart. It was first planned to insert it in the ventricle because here the blood pressure is very great, but contraction of the ventricular wall would compress the vessel and block the passage of blood. It was therefore decided to introduce the tip of the sinus into the left auricle. Since the blood pressure in the left auricle is greater than that in the right, the blood passes from the auricle into the sinus and not vice versa, and directly from the heart to the tissues of the myocardium by the venous route. If by chance this should prove unsuccessful, a situation may be established in which the development of intercoronary arterial communications with the luminal vessels is stimulated. To date this operation has been tried only in dogs. The steps of the intervention are shown in Figure 1.

The dogs responded very well to this operation. The operation is, of course, a delicate one and necessitates the opening of one of the cardiac cavities, but the possibility of employing it in human subjects should be investigated.

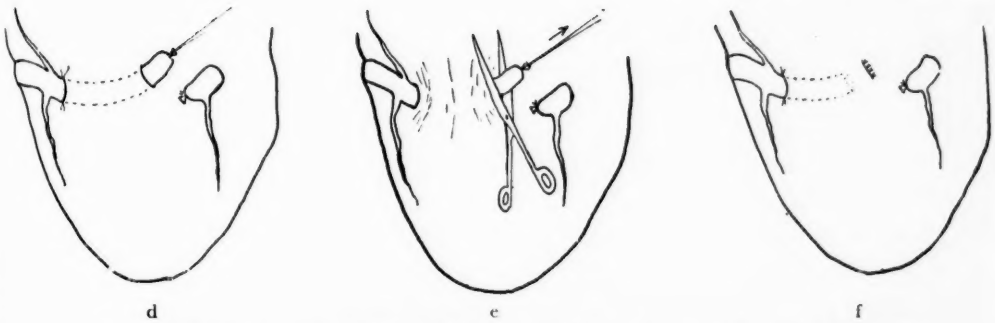
Even though this free-floating venous stump in the auricular cavity might cause thrombosis dangerous to the patient and obstruct the lumen, this danger has to be reckoned with also in other operations. The operation may, however, be interrupted at any moment. If during the process of liberation and isolation of the sinus, there should appear danger signals from the heart, the sinus can be ligated and the operation can be terminated. —*Edith Schanche Moore*

Cardiac Arrhythmias Following Mitral Valvotomy and Their Management. R. K. MACCUISH. *Acta med. scand.*, 1958, 161: 125.

THE AUTHOR analyzes 492 patients who were in normal sinus rhythm at the time of mitral valvulotomy and found that 18.7 per cent of these went into atrial fibrillation postoperatively. Approximately 1 per cent of these 492 cases developed some other type of arrhythmia from nodal rhythm to complete A-V dissociation. When routine preoperative digitalization had been used, the incidence of postoperative atrial fibrillation was less than when routine digitalization was discontinued. The larger heart and the older patient were more subject to atrial fibrillation than the others.

In the first 14 postoperative days no attempt was made at conversion of the atrial fibrillation back to normal rhythm. Conversions were attempted both with quinidine and pronestyl. There seemed to be a greater incidence of gastrointestinal disturbance with pronestyl and success seemed to be more reliably accomplished with quinidine. Because of the recent development of the atrial fibrillation, the danger of emboli following conversion to normal rhythm seemed unlikely and the author recommends that an attempt be made to revert these fibrillators back to normal rhythm. Those that were reverted seemed to maintain the normal rhythm when examined a year later.

—*Ward D. O'Sullivan, M.D.*



d e f

FIG. 1. d, The sinus passes through the slit in the auricle, its tied end emerging. The base of the sinus is fixed to the site of entrance with two sutures. e, The ligated end of the sinus is pulled well out and resected. f, The sinus is left with its open lumen communicating with the auricular cavity, and the opening in the auricle for its admission is sutured.

Experiences with Myocardial Revascularization by Division of the Internal Mammary Arteries. ROBERT P. GLOVER, J. RODERICK KITCHELL, ROBERT H. KYLE, JULIO C. DAVILA, and ROBERT G. TROUT. *Dis. Chest*, 1958, 33: 637.

PRESSURE CHANGES in the internal mammary artery proximal to the site of ligation were measured in 2 dogs. In one there was a mean rise of 7 mm. Hg pressure and in the other a mean rise of 14 mm. Hg. There was no pressure change in the internal carotid vessels with simultaneous readings.

In 14 control dogs, the anterior descending coronary artery was ligated, including its first branch, but sparing the septal branch. Nine dogs died within 20 minutes in ventricular fibrillation, 4 died within 24 hours, and one (7 per cent) died at 2 weeks with pulmonary edema.

Preliminary bilateral ligation of the internal mammary artery was done in 19 dogs, a few minutes to 48 hours preoperatively. After ligation of the coronary artery as described above, 4 died within 20 minutes and 4 more died in 24 hours. However, 11 dogs, or 58 per cent, survived 5 days or more and of these, 7 are still living. This result seems to indicate that some degree of protection was provided by ligation of the internal mammary artery.

Bilateral ligation of the internal mammary artery was carried out on 92 patients with coronary insufficiency, with or without previous infarction. The patients were unselected. Some were aged, some hypertensive, some with cardiomegaly, some with previous cardiac failure. Fifty of these were carefully followed up for 1 to 5 months. There was no further angina in 36 per cent of the patients. Angina was less severe or less frequent in 32 per cent of patients. Thus 68 per cent apparently benefited from the procedure. In most of these, relief was immediate, but in others as long as a week or 10 days passed before maximum benefit was noted.

An analysis of the results seems to suggest that the history of infarction lessened the likelihood of success with this procedure. The patients with septal infarctions were particularly unlikely to benefit from such surgery.

Evaluation of the results is particularly difficult in this disease because there is such poor correlation between the patient's subjective improvement and the objective clinical findings. In this series, only 42 per cent showed improvement in the electrocardiogram, ballistocardiogram or both, compared to 68 per cent who were clinically improved. Two patients whose electrocardiograms revealed improvement were unimproved clinically.

The procedure is safe and simple. For patients in good general condition, light general anesthesia is used consisting of sodium pentothal, nitrous oxide, and oxygen. For patients in less stable condition, local infiltration anesthesia with 0.5 per cent procaine is used. Bilateral hockey stick incisions are made over the second interspace near the sternal border. The pectoralis major muscle fibers are split and the intercostal muscles incised midway between the ribs. The internal mammary artery is carefully freed from the vein medially and from the pleura, doubly ligated and severed. —*Stanley W. Tuell, M.D.*

Coronary Vascular Anastomoses by Internal Mammary Artery Implantation. A. VINEBERG. *Canad. M. Ass. J.*, 1958, 78: 871.

TWELVE YEARS AGO the left internal mammary artery was detached from the chest wall and buried within a tunnel in the left ventricle of an animal's heart. The buried artery not only remained open but also formed a connection between itself and the coronary circulation.

During the ensuing years well over 1,500 animal experiments were performed by Vineberg and his associates in Montreal in order to determine why an artery tied and cut at its distal end and buried in a new environment such as the myocardium remains open for years.

Vineberg has stressed that the frequency and duration of mammary-coronary anastomoses are dependent upon the technique of internal mammary artery preparation and implantation plus the character of the myocardium into which the vessel is placed. Experimental proof of the value of the internal mammary artery implant has awaited a satisfactory method for

producing chronic coronary artery occlusion. Two years ago Litwack, in the author's laboratory, placed an ameroid tube encased in a steel jacket around the origins of the anterior descending and circumflex coronary arteries. This ameroid material absorbs water, expands, and slowly constricts the two coronary vessels. A series of 20 internal mammary implantations were carried out in dogs at the same time as the placing of ameroid constrictures around the anterior descending and circumflex coronary arteries. Five dogs died within 5 weeks and the injection of the implanted internal mammary artery with Schlesinger's mass showed internal mammary artery anastomoses with arteries of the anterior ventricular wall in 3 of these 5 dogs. Mammary-coronary anastomoses were demonstrated to include the anterolateral left ventricular arteries in each of 8 dogs which died 5 to 12 weeks after the original operative procedure. Six dogs which lived more than 5 months after the internal mammary implantation were found to have communications between the implanted vessel and the arteries of the entire left ventricle.

Since 1950 Vineberg has operated on 59 patients with coronary artery heart disease utilizing the internal mammary artery implant. Seventeen patients with preoperative angina decubitus had an operative mortality of 59 per cent. Forty cases with no angina at rest preoperatively had an operative mortality of 5 per cent. The author concludes that surgery should not be performed when the patient has angina decubitus. An analysis of patients with angina at rest without exciting cause reveals that in addition to a high mortality rate in this group, only one patient is working full time and only 2 patients or 12 per cent of the original group were benefited postoperatively. Conversely, of 40 patients with no angina at rest without exciting cause, 80 per cent were unable to work before the internal mammary implantation, whereas 78 per cent of the survivors and 70 per cent of the original group were pain-free or had less pain postoperatively, and 88 per cent of the survivors returned to work. Vineberg stressed that histological studies made on the mammary artery implant in patients dying postoperatively have shown open implanted vessels without significant intimal proliferation.

—*Gilbert S. Campbell, M.D.*

A Report on the Use of Both Extracorporeal Circulation and Hypothermia for Open Heart Surgery. Will C. Sealy, Ivan W. Brown, Jr., and W. Glenn Young, Jr. *Ann. Surg.*, 1958, 147: 603.

Hypothermia alone allows only limited operating time for intracardiac surgery, and low-flow extracorporeal circulation suffers from the same deficiency. However, the decreased oxygen requirements in hypothermia may be supplied by a simple low-flow extracorporeal pump oxygenator, so that adequate time is permitted for careful repair of complex intracardiac defects. The clinical experience with 46 patients who were managed with this combined technique is presented.

A special plastic bag oxygenator was used in the first 22 cases, and a modified De Wall oxygenator in the subsequent 27. In the first 40 cases external body cooling was used to produce hypothermia. This method requires one to two hours to reduce body temperature to the desired level. In the last 9 patients a heat exchanger incorporated into the extracorporeal circuit was used to obtain the hypothermia, and by this means the desired cooling was obtained in 3 to 10 minutes. The range of 30 to 31 degrees C. was sought in all cases.

The cases were divided into two groups, one of patients with a right ventriculotomy and the other of patients with atrial or valvular lesions. In the latter group of 25 patients there was one death two weeks after operation from causes not related to the perfusion. In the 21 patients with right ventriculotomies, there were 9 deaths. In none of the survivors has there been any damage to the central nervous system. In some cases a transient deterioration in the pattern of the electroencephalogram appeared in the first minute of perfusion, but this rapidly returned to normal. Flow rates used varied considerably, ranging from 12 to 55 c.c. per kgm. per minute.

During perfusion the blood pressures varied from 40 to 100 mm. of mercury, averaging about 60 in most instances. Adequate arterial and venous oxygen saturation were uniformly obtained. Metabolic studies were made, data being obtained on arterial pH, carbon dioxide tension, and lactic acid. There were remarkably few variations from normal limits in these studies.

The problem of ventricular irritability with fibrillation has not presented any difficulties, nor contributed to the bad results. Spontaneous fibrillation occurred in 2 cases, both due to air emboli. In half of the ventriculotomies, fibrillation followed washing out of the cardioplegic solution. Electrical defibrillation was uniformly successful without difficulty.

—*E. Thomas Boles, Jr., M.D.*

Experimental Open Heart Surgery Employing Hypothermia, Mecholyl Arrest, and Carotid Perfusion. Stanley K. Brockman and Eric Fonkalsrud. *Surgery*, 1958, 43: 815.

Experiments were performed with the objective of obtaining an approach to open heart surgery which would provide enough operative time under hypothermia, thus avoiding the complexities and risks of using a pump oxygenator. The basis of the approach is the use of carotid perfusion along with hypothermia and mecholyl to induce cardiac arrest when longer than 15 to 20 minutes operative time is required.

Under sodium pentobarbital anesthesia, hypothermia of 28 to 30 degrees was attained. After occluding the vena cava, emptying the heart, and cross clamping the pulmonary artery and aorta, cardiac arrest was induced with 1.2 to 1.4 mgm. per kilogram of mecholyl. Artificial respiration was then stopped and ventriculotomy was performed. Following closure of the cardiac incision, cardiac action was initiated by the use of atropine and epinephrine plus cardiac massage. Fibrillation of a vigorous type usually resulted, but sinus rhythm was readily restored with electrical defibrillation.

Three groups of dogs were studied. In one group mecholyl arrest was effected without carotid perfusion. Cardiac exclusion lasted from 15 to 30 minutes.

In a second group mecholyl arrest was also effected. In addition, through plastic catheters in the subclavian artery and in the superior vena cava through the azygos vein, perfusion of arterial blood obtained from donor dogs was carried out at rates of 1.3 to 3.6 c.c. per kilogram per minute. Cardiac exclusion in these dogs was carried out from 32 to 50 minutes. In a third group arrest was effected with potassium citrate, and carotid perfusion also carried out.

When circulatory arrest exceeded 20 minutes in those dogs without carotid perfusion, the dogs failed to awaken and expired in the early postoperative period. In the group in which carotid perfusion was used, long standstill periods were safe. The only evidence of neurologic damage was in one dog with the lowest perfusion rate and this consisted of a transient ataxia. It was demonstrated in the group of animals in which potassium was used that restoration of the heart beat is uncertain, and the period of arrest more prolonged with the use of potassium than with the use of mecholyl.

Oximeter measurements of the blood used for perfusion demonstrated 93 per cent oxygenation of the arterial blood and 39 per cent in the venous return. The rates of 1.7 c.c. per kilogram per minute appeared to be adequate in these dogs to protect against cerebral damage. Acetylcholine appears effectively to abolish the cardiac depressant effects of mecholyl. In view of the incidence of fibrillation, the authors believe that isuprel might prove to be more useful than epinephrine in restarting the heart action.

The authors believe that it may thus be possible to develop a method for open cardiac surgery by means simpler than extracorporeal circulation.

—*Hermes C. Grillo, M.D.*

Pulmonary Complications of Open Heart Operations; Their Pathogenesis and Avoidance. WILLEM J. KOLFF, DONALD B. EFFLER, LAURENCE K. GROVES, C. ROBERT HUGHES, and LAWRENCE J. MCCORMACK. *Cleveland Clin. Q.*, 1958, 25: 65.

THE THESIS is presented that temporary overloading of the pulmonary circulation with blood is the most important single factor in the initiation of the capillary damage that marks the beginning of the severe pulmonary complications following open heart operations.

The pathogenic factors in pulmonary complications are: pre-existing pulmonary vascular disease, oxygen intoxication of the alveolar and capillary cells, the use of too much fluid, air embolism to the lungs, and temporary overloading of the pulmonary circulation with blood. The latter would appear to be the most important single factor since overloading for even short periods of time may initiate capillary damage with various degrees of extravasation of blood.

The circumstances that lead to overloading of the pulmonary circulation are:

1. Forward overfilling of the pulmonary vascular bed such as that which occurs during partial bypass before the venae cavae are occluded. This may also occur during total bypass when the venae cavae are tied off but the right side of the heart is closed and coronary sinus blood flow into the right atrium builds up increasing pulmonary vascular pressure.

2. The overfilling of the pulmonary vascular bed through collateral vessels may occur in patients with a patent ductus arteriosus or in patients with the increased bronchial arteries which accompany tetralogy of Fallot.

3. Retrograde overfilling of the pulmonary vascular bed, excess blood in the pulmonary veins caused by impeded venous outflow or by backflow. Mechanical obstruction of the pulmonary veins or of a single pulmonary vein may occur following surgical attempts to correct transposition of the great vessels or following correction of atrial septal defects with associated anomolous pulmonary venous drainage. Obstruction of the mitral ostium may also increase pulmonary venous pressure. Dynamic obstruction may occur in ventricular fibrillation or with an ineffective left ventricular beat. It sometimes occurs when the patient is taken off the pump and returned to his own circulation and the right ventricle is more effective than the left, causing an increase in pulmonary venous pressure. Overfilling of the pulmonary vascular bed by a combination of the above factors may occur.

An analysis of 140 patients who underwent open heart operations is presented and 5 cases are presented in detail.

Forward overfilling of the pulmonary vascular bed can be avoided during partial bypass by careful control of the volume of the heart-lung machine. Electronically controlled devices are available to maintain a constant volume of the pump-reservoir system.

Accumulation of coronary sinus blood can be avoided when the right side of the heart is closed by a cannula in the right atrium and monitoring of the pressure.

Filling of the pulmonary vascular bed through collateral vessels can be avoided by closing an open patent ductus prior to surgery. Increased bronchial circulation as a cause of excessive filling of the pulmonary vascular bed is controlled by a cannula in the left atrium which is used to drain off excess blood.

Retrograde overfilling whether due to mechanical obstruction, dynamic fibrillation, or insufficient left ventricular contraction may be avoided by a large cannula in the left atrium. By monitoring the pressure in the left atrium overfilling can be avoided, except that which is due to obstruction of a pulmonary vein.

—*John H. Davis, M.D.*

ESOPHAGUS AND MEDIASTINUM

Esophagitis. GEORGE H. HUMPHREYS II. *Surg. Clin. N. America*, 1958, April, p. 351.

THE ESOPHAGUS is a distensible muscular tube lined with tough squamous epithelium, similar to skin, and endowed with autonomic nervous peristaltic action. Although its lining is more resistant to mechanical trauma than the mucous membrane of the stomach and intestine, it lacks the protection of glandular secretions from digestive enzymes and cannot destroy the bacteria which constantly pass through it. The looseness of its surrounding tissue, lack of protective peritoneal covering, and the constant presence of bacteria within it, make this organ particularly vulnerable to inflammation once the defenses of its lining have been breached. Its scanty, segmental blood supply

and its relatively inaccessible location, make it the most difficult segment of the intestinal tract with which one has to cope surgically. Damage to the esophagus may be either acute or chronic, from external or internal injury, or from obstruction or regurgitation.

If there is external perforation with penetration of the lumen, there is resultant leakage of infected material into the periesophageal areolar tissue. Mediastinitis then extends rapidly and prompt drainage and antibiotic therapy are essential to avert a fatal outcome. Immediate repair of the esophageal wound may be feasible if the injury has been recognized before extensive infection has occurred. Internal perforation by sharp objects is more difficult to recognize promptly. Occasionally, a simple puncture will heal without drainage under cover of immediate massive antibiotic therapy. However, drainage usually is necessary.

Nonpenetrating injuries usually result from the ingestion of caustic or corrosive substances, such as lye or concentrated acid. This chemical burn coagulates and destroys the lining epithelium to a degree which is in proportion to the amount of material ingested plus the length of exposure. Within 24 hours, acute edematous inflammation will occur in the area of injury and complete obstruction results if these areas are sufficiently extensive. The epithelium will regenerate to cover granulating, denuded areas. If these are not circumferential or extensive, there may be little resultant disability. Usually, however, some scarring and consequent narrowing and distortion of the lumen is inevitable. When there is extensive involvement, the lumen is seriously compromised because of the contraction of the scar tissue resulting from fibrosis in the muscular coats and granulating surfaces in the lumen. This type of stricture is one of the most common of the chronic problems, as well as one of the most troublesome.

Strictures may follow acute injury, including wounds, burns, and surgical procedures; they may be congenital; or they may occur as the end result of a long-standing chronic inflammatory process. Congenital stricture or stenosis is not common and is characterized by a segment of esophagus, usually in the lower third, in which the lumen is narrowed without fibrosis or other evidence of inflammation. There is no accompanying fistula between the esophagus and trachea and swallowing usually is not affected until the child is given solid food. If the lesion is confined to the mucous membrane, stretching with bougies may correct it. If the entire wall is involved, dilatation will be ineffectual and dangerous, since the possibility of rupture of the wall exists.

Posttraumatic stricture is due to narrowing of the lumen by circumferential scar. Gradual dilatation may be effectual in restoring an adequate lumen when the stricture is sharply localized. When the injury is extensive, strictures may be present at multiple sites or the entire lumen may become narrowed and distorted. In these instances, dilatation is difficult and hazardous since perforation is a constant danger and usually a feeding gastrostomy is necessary. If this is the case, a fine strong string may be passed through the esophagus and drawn out through the gastrostomy opening so that dilatation may be accomplished through the stricture from below upwards. Repeated instrumentation is often accompanied by chronic esophagitis and there may never be restoration of the normal eating habits. Thus, transplantation of a segment of jejunum or colon between the upper esophagus and the stomach may be preferable. These operations now hold the most promise for the patient whose esophagus has become so chronically inflamed that normal peristalsis can never be expected to return. Similarly, radical resection is the only treatment possible in cases of postinflammatory stricture.

Diverticula, either pulsion or traction, are among the chronic conditions which may lead to esophagitis. Traction diverticula usually occur in the midportion of the esophagus, where it is apposed to the lymph nodes underlying the tracheal carina and surrounding the primary bronchi. After chronic inflammatory processes, the esophagus tends to become fixed at one or more points to unyielding scar tissue in the vicinity of the rigid bronchus. The entire wall of the esophagus is drawn outward in a conical fashion without weakening of the muscular wall. Usually there is no stasis and no inflammatory reaction and this type of diverticulum will seldom give rise to symptoms. On the other hand, pulsion diverticula occur as the result of a localized weakening of the muscular wall of the esophagus and the epithelial lining is displaced by the pressure of peristaltic waves during swallowing. The posterior junction of the inferior constrictor of the pharynx with the intrinsic muscle of the esophagus is the most frequent site of occurrence. The diverticulum protrudes at a right angle to the esophageal lumen in its early phases and is relatively asymptomatic. With the passage of time, it becomes larger and its axis turns downward since the propulsive force is in that direction. Stasis and inflammation now occur in the dependent pocket and regurgitation of unchanged food eaten at the beginning of a meal, sometimes hours after the main meal has been finished, is a pathognomonic symptom. Fermentation and inflammation create severe symptoms which may seriously interfere with nutrition. Surgical repair of pulsion diverticula is simple and free of risk if carried out before stasis and secondary inflammation have begun. Diverticula of pharyngoesophageal origin are approached through the neck and the epithelial pouch can be lifted upward and amputated after a cuff of muscle has been developed about its neck. Care must be taken not to remove too much epithelium lest stricture formation result.

The term cardiospasm is used to portray a condition characterized by dysfunction of the terminal esophagus resulting in failure of prompt emptying. Functional dysphagia is the predominant symptom early in the course of the disease when it can often be corrected by simple dilatation. Once chronic esophagitis is well established, more vigorous treatment is necessary. Heller's operation is the treatment of choice and is usually carried out by exposing the terminal esophagus through a transpleural approach and incising the hypertrophied muscle down to the epithelium. This incision must include the gastric muscle surrounding the entrance of the esophagus into the stomach.

Achalasia is a term which implies dilatation, thickening, and chronic inflammation of the greater part of the thoracic esophagus. It is presumed that this condition is a late result of severe cardiospasm although it may well be that achalasia develops from true neuromuscular anomalies. Food is retained in the esophagus for long periods, emptying slowly by gravity only. The epithelium is boggy, macerated, and ulcerated by fermentation in the retained food. The most troublesome symptom is hemorrhage from ulceration of the esophageal wall and this may occur suddenly and without warning. Instrumental dilatation is useless and dangerous since the softened wall will offer little resistance to perforation. The only possible treatment is surgical and as in severe cardiospasm, early or milder forms of achalasia may be relieved by the Heller muscle-splitting cardioplasty. In the presence of tortuous kinking of an elongated esophagus, seen in the more advanced case, some form of resection is required. Resection of the lower third of the esophagus with wide intrathoracic esophagogastrostomy has been employed but radical esophageal replacement is now preferred.

Hiatal hernia also is a cause of chronic esophagitis, wherein the "sliding" type of hernia results in esophagitis due to gastric reflux. Spasm, dysphagia, substernal pain radiating through to the back, choking, and dyspnea on stooping are typical symptoms. Peptic ulceration of the esophagus with penetration through the muscular wall may complicate the picture occasionally but more frequently chronic esophagitis leads to stricture as a late result. Surgical repair consisting of restitution of the normal angle of entrance of the esophagus into the stomach plus narrowing of the hiatus with fixation of the stomach to the overlying diaphragm yields satisfactory results. Since the gastric cardia is again competent, reflux no longer takes place and symptoms are completely relieved. If penetrating peptic ulcer is present at operation, or if the lower esophagus is so inflamed that mobilization essential for hernia repair is impossible, resection and replacement with bowel is the operation of choice.

The Plummer-Vinson syndrome is a form of esophagitis following prolonged inadequate nutrition and is associated primarily with lack of vitamin B complex. The therapy consists of an intensive high vitamin, high calorie diet.

The transplantation of bowel to replace resected esophagus is becoming an accepted procedure when the esophagus is irreparably diseased. This is particularly true in esophageal replacement following resections for cancer or esophageal varices, and as a solution to the problem of advanced esophagitis due to stricture, achalasia, or hiatal hernia. When these bowel segments are transplanted, their peristaltic action carries food and saliva into the stomach and prevents any appreciable reflux of gastric content into them. The vagus nerves are divided to bring about diminished gastric secretion of acid and the pyloromyotomy or gastroenterostomy as part of the procedure obviates delay in gastric emptying. Successful interposition of an isoperistaltic bowel segment between the upper thoracic or lower cervical esophagus and the stomach is so satisfactory that there can be no question as to its superiority over other methods when the esophagus has been damaged beyond possibility of normal peristaltic emptying. The ascending colon and proximal jejunum are most frequently employed. The magnitude of the operation and the great consequent risk involved preclude that these operative procedures should be confined to situations in which no simpler procedure can be expected to succeed. However, in these situations, the operation is dramatically successful in restoring an invalid to normal life.

—*James H. Holman, M.D.*

Cancer Associated with Megaesophagus (Cancer sur magaoesophage). P. SANTY, P. MICHAUD, and H. VIARD. *Lyon chir.*, 1958, 54: 354.

FOUR PER CENT of 180 cases of megaesophagus (achalasia of the esophagus) observed by the author were complicated by cancer. Megaesophagus occurs more frequently in males, and the 7 patients with this condition who developed cancer of the esophagus were all males. All were alcoholics. There are a few cases of cancer of the esophagus associated with megaesophagus in females reported in the literature.

Cancer associated with megaesophagus occurs at a younger age than does carcinoma without megaesophagus. Usually this neoplasm occurs in patients with megaesophagus of long duration and, in the 7 patients reported, megaesophagus existed for 9 to 40 years before carcinoma became apparent.

In 2 patients, the esophageal cancer involved the cardia; in 5 it was in the midthoracic esophagus.

Usually patients with megaesophagus are under observation or under treatment by bouginage. They have dysphagia, which often is not altered until the carcinoma becomes advanced. The neoplasm is therefore not diagnosed as early in the course of the disease as is carcinoma of the esophagus without megaesophagus.

Esophagitis and stasis which are constant features of megaesophagus may be related to the development of neoplasia.

Roentgenography is important in the diagnosis of this condition. Films from a variety of angles must be available. Adequate visualization of the segment of esophagus distal to the dilated segment should be obtained.

Endoscopy, in spite of its hazards in patients with megaesophagus, is recommended. The esophageal pouch must be emptied of retained fluid so that its entire wall may be inspected.

Cytologic examination is also helpful in diagnosis.

Treatment of this condition is the same as for esophageal cancer without megaesophagus. In only 2 of the authors' 7 patients was curative resection possible. One of these died postoperatively and the other was alive 7 months after resection. Only palliative procedures were possible in the other 5.

The authors conclude that megaesophagus predisposes to the development of carcinoma and that the mechanism of this complication is at present unknown.

—*Frederick W. Preston, M.D.*

Tumors and Cysts of the Mediastinum. ALFRED J. HERLITZKA and JOSEPH W. GALE. *Arch. Surg.*, 1958, 76: 697.

THE AUTHORS report the cases of 174 patients with mediastinal tumors or cysts who were operated upon

at the University of Wisconsin Hospital from 1939 to 1957. A tumor of the mediastinum is no longer considered a medical curiosity. It was once thought to be a lesion of obscurity and inaccessibility, but with the advent of routine and mass-survey chest x-rays and improved surgical techniques it has become a lesion of ready visibility and resectability. The ages of the patients in this series ranged from 2 weeks to 81 years, and included 92 females and 82 male patients. The authors classified their cases as to frequency and found neurogenic tumors to be the most frequent (20.1 per cent) followed by teratodermoids (14.9 per cent), and bronchogenic cysts (13.8 per cent). The remainder were pericardial cysts, thymomas, lymphomas, substernal goiters, and miscellaneous lesions.

The neurogenic lesions usually occupied the posterior mediastinum, the goiters and thymomas the anterior superior mediastinum, and the teratodermoids and pericardial cysts the anterior inferior mediastinum, while the lymphomas and bronchogenic cysts often occurred in the hilar mediastinum.

Forty-three per cent of the lesions in the entire group were detected either by mass-survey 70 millimeter or routine chest roentgenograms. With the exclusion of the miscellaneous lesions, an accurate radiologic diagnosis was made in 68 per cent of the cases reviewed. Symptoms were nonspecific but present in 62 per cent of the cases. Most frequent symptoms were pain, in 34 per cent; cough, in 30 per cent; and dyspnea, in 21 per cent.

Forty-five tumors, or 25 per cent of the entire series, were malignant. Of the 45 lesions, 20 were resectable, with 10 patients living 2 or more years without obvious recurrence. There were 4 operative deaths, a surgical mortality of 2.3 per cent.

Seventy-seven per cent of the tumors of neurogenic origin were benign; these consisted of 19 neurofibromas, 5 ganglioneuromas, and 3 neurilemmomas. Twenty-three per cent were malignant, consisting of 3 neurofibrosarcomas, 3 neuroblastomas, and 2 Schwannomas. The posterior mediastinum was the usual location of the neurogenic tumors, especially the neurofibromas. In this group of tumors pain was the most frequent symptom and was present in 40 per cent. Prognosis was excellent when the lesion was benign. Of the malignant group, 3 patients were well 2, 3, and 4 years, respectively, after resection of the tumor.

The dermoid cysts and teratomas were combined and these together formed the second most frequent group of mediastinal lesions. The age group varied from 3 months to 69 years, the average age being 24 in the teratoma group and 35 in the dermoid group. There was no sex preference. One-third of these patients were asymptomatic. There were 26 patients in this group and all of the lesions but 2 were benign. All were located in the anterior inferior mediastinum. The lesions were usually discrete, circular, or globular and of homogeneous density. At times calcium, plaques of bone, and teeth were noted. Pleural effusions were present in two of the benign dermoid lesions. Both the malignant lesions had squamous-cell changes and were nonresectable.

There were 24 bronchogenic cysts. These lesions were usually located in the hilar (11) or posterior (7) mediastinum in relation to the trachea and major bronchi but they were found everywhere in the mediastinum. Usually they were spherical, unilocular, fairly thin-walled cysts, containing mucilaginous material. Typically, the cysts were lined by ciliated pseudostratified squamous epithelium and bronchial glands; however, fluid, pressure, and infection destroyed this characteristic mucous lining in 6 cases. Most of these lesions were detected in the third and fourth decades with an even sex distribution. Symptoms were mild and primarily respiratory. All of the cysts were resected.

There were 17 cases with pericardial cysts which were unilocular, thin-walled, benign lesions composed of fibrous connective tissue walls lined by flat or cuboidal endothelial or mesothelial cells. In 53 per cent of cases the lesions were asymptomatic. They were typically located in the anterior inferior mediastinum. Occasionally they were confused with diaphragmatic hernia, dermoid cyst, or pericardial fat pad. One communicated with the pericardial cavity, forming a rare pericardial diverticulum. All contained a clear serous fluid and were readily removed.

There were 10 benign thymomas and thymic cysts, and 4 malignant cases in this group. There were 2 patients with myasthenia gravis. Both lesions were histologically malignant lymphoendotheliomas. No symptomatic improvement was noted after resection of the lesion. All benign lesions except one were completely excised. Three of the four malignant tumors were resectable.

The lymphoma group consisted of 7 lymphosarcomas, 2 lymphoblastomas, 2 cases of Hodgkin's disease, and 1 simple lymphoma. The authors mention that lymphomas are actually the most frequent lesions in the mediastinum, but most are diagnosed without a thoracotomy and are treated by x-ray or chemotherapy. Most of the lesions in this series occurred in the hilar or anterior mediastinum. The ages varied from 23 to 66 years with an average of 51 and there was no sex preference. All patients were symptomatic, with varied symptoms of cough, pain, weight loss, dyspnea, wheezing, and hoarseness.

There were 10 intrathoracic goiters, 9 were benign and one was malignant. These were characteristically located in the anterior superior mediastinum with extension inferiorly. Two had retroesophageal extension, 3 were bilateral, and 3 had an associated enlarged cervical thyroid. Of the unilateral lesions, 6 of the 7 were located on the right side. The mean age was 60 years, with 6 of the lesions occurring in females. Half of these were detected by routine chest roentgenograms. Symptoms were present in 40 per cent and consisted of dyspnea, cough, pain, and dysphagia. Two of these had a toxic thyroid. The one malignant case had a papillary adenocarcinoma and this patient had a cervical thyroid adenoma palpated 10 years previously.

There were 36 cases listed in the miscellaneous group. Of the lesions in this group, 18 were malignant and all but 10 of the growths were completely excised.

The authors conclude the article with a plea for surgery as soon as the mediastinal tumor or cyst is detected, since nearly all of these are resectable.

—*Donald M. Clough, M.D.*

Tumors of the Anterior Mediastinum. ROGER W. O'GARA, ROBERT C. HORN, JR., and H. T. ENTERLINE. *Cancer*, 1958, 11: 562.

A CRITICAL REVIEW is presented of all tumors arising in the anterior mediastinum that were observed in the laboratory of surgical pathology of the Hospital of the University of Pennsylvania from 1939 to 1955. Of 51 primary tumors there were 23 thymic lesions, 10 malignant lymphomas, 10 teratomas or related tumors, and 8 miscellaneous lesions. The difficulty in classification of thymomas is emphasized. No histopathologic characteristics were observed that would distinguish benign from malignant thymomas; however, the patients with encapsulated thymomas had a more benign clinical course than those with nonencapsulated tumors. Nineteen per cent of patients with thymomas had myasthenia gravis. The patients with thymomas had a longer clinical course than did those with malignant lymphomas, and although less responsive to radiation therapy than the malignant lymphomas, the thymomas did not metastasize. Five patients with benign cystic teratomas and 5 with malignant teratomas were included in the series. Three of the malignant teratomas were growing predominantly as seminomas and the patients showed long term survival. —*Harvey W. Baker, M.D.*

Granulomas of the Mediastinum Surgically Treated and Followed Up to 9 Years. KARL E. KARLSON and JOSEPH J. TIMMES. *J. Thorac. Surg.*, 1958, 35: 617.

GRANULOMAS OF THE MEDIASTINUM assume surgical significance because they may present as mediastinal tumors of undetermined etiology, necessitating exploratory thoracotomy for diagnostic purposes, and because such tumors occasionally encroach upon vital neighboring structures and cause complications.

In the early reports, these lesions were designated as "tuberculomas" but actually they are conglomerate caseous granulomas of the lymph nodes, often described pathologically as "consistent with tuberculosis." Grossly and histologically these lesions are typical of tuberculosis in most cases, but the etiology cannot be determined with accuracy because organisms are not often demonstrable. Fungi may produce similar lesions. The authors suggest mediastinal granuloma as a more accurate term for these lesions.

This report deals with 19 patients who were subjected to exploratory thoracotomy for mediastinal tumors which proved to be granuloma. They have been traced for periods up to 9 years. Most of the masses were discovered on routine chest x-rays, and presented as mediastinal masses projecting from the mediastinum to the right, above the hilum of the right lung. Fifteen of these granulomas were in the right paratracheal region beneath the mediastinal pleura, immediately superior to the right hilum. Often the mass was intimately adherent to the trachea, bronchus, superior vena cava, azygos vein, or pulmonary artery.

All of the lesions were found to be granuloma histologically and 9 had remnants of lymph nodes in the walls. All were cultured for tuberculosis and three lesions were positive. One that was negative for culture contained acid-fast bacilli microscopically. One lesion was positive for Histoplasma.

In 13 cases, complete resection was performed. Six other lesions were only partially resected because of their adherence to the trachea, bronchus, vena cava, or pulmonary artery. All the patients recovered from thoracotomy without a complication. Eleven of the patients received some combination of streptomycin, isoniazid and/or para-aminosalicyclic acid for periods ranging from 6 weeks to one year with no postoperative evidence of disease during follow-up periods up to 6 years. Two patients were treated with bed rest for 3 to 5 months and are all well. Six patients received no postoperative therapy and active pulmonary tuberculosis has subsequently developed in 2 of these.

The authors state that their experience with excision of these granulomas is similar to that of other workers. Exploratory thoracotomy is indicated for all mediastinal tumors of undetermined etiology. Complete removal of a mediastinal granuloma is the procedure of choice if it can be accomplished. Removal is indicated to prevent complications of encroachment of the granuloma on the trachea, bronchus, superior vena cava, esophagus, or lung and to remove a focus of possible exacerbation of disease. If complete excision is impossible because of adherence to neighboring vital structures, removal of as much as possible probably is helpful in preventing further complications involving these structures.

Postoperative antituberculosis therapy for 6 to 12 months should be administered to prevent subsequent spread or reactivation of tuberculosis unless a nontuberculous etiology is definitely established.

—*David E. Hallstrand, M.D.*

MISCELLANEOUS

The Distribution of the Terminal Branches of the Phrenic Nerve in Relationship to Surgical Incisions of the Diaphragm (La distribuzione terminale del frenico in rapporto alle incisioni chirurgiche del diaframma). G. MONTEVERDE. *Chir. pat. sper.*, Milano, 1958, 6: 247.

DIVISION OF the phrenic nerve results in paralysis and atrophy of the diaphragm. Therefore, a sound knowledge of the relationships of the phrenic nerves and their terminal branches to diaphragmatic landmarks is a prerequisite to incisions of the diaphragm.

The author carried out dissections on the diaphragm in situ and also examined sections prepared by maceration in acetone. The following observations were made.

The right phrenic nerve runs along the lateral aspect of the vena cava and before reaching the diaphragm it divides into two primary trunks, the anterior and posterior. The anterior branch runs obliquely forward and terminates on the central tendon near the foramen of the vena cava by dividing into two large branches. Of these two, the medial branch runs anteriorly and medially, ending in numerous small branches distributed to the anterior portion of the central tendon and to the muscle fibers inserted on the sternum and the costal margin. The other, or anterior, branch runs anteriorly and ends in numerous branches distributed to the anterior fibers of the diaphragmatic muscle. The posterior primary trunk divides almost immediately into two branches which diverge in transverse directions. The medial branch gives fibers to the pillars of

the diaphragm and the lateral branch disappears with its terminal branches in the lateral portion of the central tendon.

The left phrenic nerve reaches the diaphragm by running along the left border of the heart. A few centimeters above the muscle the nerve divides into two primary trunks. Their distribution is essentially similar to that on the right side. Anastomoses between the terminal branches of the nerve were observed. There were also large anastomotic trunks between the primary trunks.

On both sides the phrenic nerves are in close relationship to the diaphragmatic arteries, branches of the internal mammary artery. This relationship is maintained by the terminal branches of the nerves which remain close to the arterial branches.

The following practical conclusions were made.

In view of the fanlike distribution of the terminal branches of the phrenic nerve away from the diaphragmatic dome, incisions in the muscle should parallel the direction of the fibers. Furthermore, incisions in the central tendon should be avoided. If the esophageal hiatus is to be enlarged, the incision should be carried anteriorly if damage to the nerves is to be avoided.

—*René Menguy, M.D.*

The Treatment of Chylothorax (Zur Therapie des Chylothorax). E. STRAHBERGER and G. SCHEUBA. *Thoraxchirurgie*, 1958, 5: 514.

CHYLOTHORAX is said to occur most commonly following trauma, compression, or erosion due to tumor growth. However, the authors believe that in their experience it has occurred following thoracic surgery and injury to the duct concomitant with dissection. The anatomy and the roentgenographic findings of chylothorax have been well studied. The operative therapy has varied from repeated aspiration to ligation of the duct, and in a few instances an attempt at direct repair. According to the authors the first ligation of the thoracic duct was reported by Lamson in 1946.

The volume of chyle can reach a total of 4 liters in any day, of which 4 per cent of the material is fat, and approximately 3 per cent is protein. When there is an excessive production of chylothorax there can be a considerable and severe loss of fat, protein, and water to the body and the circulation. The authors point out that there is a reasonable means of compensation whenever the duct is ligated or damaged, through collateral systems, such as the lumbar, intercostal, and azygos veins.

The authors tabulate the results of the treatment of 7 cases of chylothorax. Two of the cases involving a 57 year old woman and an 11 month old child appeared to be spontaneous in nature. The remaining 5 cases were 3 of lobectomy or pneumonectomy in 50 year old individuals, one of bilateral sympathectomy for hypertension in a 37 year old woman, and one a Blalock procedure for the tetralogy of Fallot in a 15 year old male. Of the 7 patients, one expired, the 11 month old child who suffered, apparently, from acute cardio-pulmonary embarrassment due to total collapse of the lung. All of the remaining patients were treated conservatively with repeated aspirations. The aspiration therapy varied from 21 to 90 days in the patients that survived.

The authors concluded that conservative therapy is the treatment of choice and that ligature of the thoracic duct should be reserved for those patients who have an excessive production of chyle over an extended period of time.

—*Walter L. Byers, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Peritoneoscopy; A Revaluation. SAMUEL J. ZOECKLER. *Gastroenterology*, 1958, 34: 969.

THE AUTHOR has previously reported on 800 cases in which peritoneoscopy was used as a diagnostic procedure and the present report includes the last 1,000 consecutive peritoneoscopic examinations.

Peritoneoscopy with direct vision liver biopsy has been accomplished successfully, with the biopsy from a selected site in the organ. This has been of importance in the study of diseases of the hepatobiliary system. The confirmation of a diagnosis is important as is the discovery that a clinical impression is incorrect. In many instances the correction of an erroneous diagnosis of cirrhosis enabled a better prognosis to be given. In 12.8 per cent of the patients in whom a diagnosis of gallbladder disease was found to be erroneous, the plan of therapy was altered and surgical intervention avoided. In intra-abdominal disease of obscure or generalized etiology, peritoneoscopy was considered helpful and in several instances in which malignancy was suspected, it was ruled out by demonstration of other pathologic processes. In 25 per cent of cases of proved malignant disease, abdominal or thoracic exploration was not necessary following peritoneoscopy. In only 7 per cent of the cases in which previous surgery had been done was the result of the examination unsatisfactory because of adhesions. Bowel distention or obesity were more frequent causes for difficulty in the examination. Examination and direct biopsy of the liver are followed by minimal morbidity and mortality and the discomfort following the procedure is usually of short duration. The clinical usefulness of the technique finds its greatest value when it is used in the investigation of primary diseases of the hepatobiliary system or to elucidate problems concerned with actual or potential intra-abdominal problems. Direct cholangiography is to be avoided.

In the 1,000 cases reported there were 3 deaths. One was due to intrahepatic injection of air and subsequent air embolism, a second was due to bile peritonitis secondary to necrosis of the gallbladder which followed a direct cholangiogram, and a third was attributed to hemorrhage following liver biopsy in a patient who had an abnormally prolonged prothrombin time. —*W. Harrison Mehn, M.D.*

Staphylococcal Peritonitis in the Newborn. D. W. BEAVEN. *Lancet*, Lond., 1958, 1: 869.

THE AUTHOR reports 5 cases of staphylococcal peritonitis in infants. There is an increasing incidence of all staphylococcal lesions in this age group. Despite this increased incidence, no report on staphylococcal peritonitis was found in the English literature of the past 10 years. The characteristic clinical picture is as follows: The infant is pale, listless, and acutely ill, with grunting respirations, peripheral cyanosis, and a uniformly distended tender abdomen. Bowel sounds are absent. A frequent source of staphylococcal septicemia is found in the form of pustules on the legs or an infected umbilical cord. The onset is sudden with collapse within 24 to 36 hours. The following features enabled the strong provisional diagnosis of staphylococcal peritonitis to be made in the last 3 patients seen: (1) a history of vomiting unassociated with diarrhea, (2) a tender, distended tympanitic abdomen with reduced or absent bowel sounds, and (3) pre-existing staphylococcal skin lesions. These cases of peritonitis did not develop before the fourteenth day of life. Murray, *et al.* showed in 1953 that transmitted maternal antibodies appear to protect the baby in the first two weeks of life. The differential diagnosis should include the more common causes of peritonitis, such as perforated or gangrenous bowel and meconium ileus. The tympanitic abdomen and silent bowel should prevent confusion with respiratory infections in these cyanosed and distressed babies, who often have rapid grunting respirations.

Adequate treatment with the correct antibiotics seems to influence the prognosis and currently, erythromycin, 150 to 200 mgm./kgm. of body weight daily alone or in combination with novobiocin, 100 mgm./kgm. of body weight daily, is preferred. It is of interest that of the 5 patients seen by the author, 3 lived and all 3 were operated upon and drainage instituted. The other 2 infants who were treated with antibiotics alone succumbed to the disease. Dehydration and electrolyte imbalance from vomiting may need to be corrected before operation. In babies with severe shock and collapse there is a place for the intravenous administration of hydrocortisone. —*Lloyd D. MacLean, M.D.*

The Treatment of Peritonitis of Appendiceal Origin with and Without Intraperitoneal Terramycin. KENNETH O. ADWAN, FORREST E. LUMPKIN, JERRY A. STIRMAN, and BEN J. WILSON. *Am. Surgeon*, 1958, 24: 452.

THE PURPOSE of this investigation was to determine whether the intraperitoneal administration of terramycin had any beneficial effect in peritonitis. The authors chose peritonitis of appendiceal origin for their study in order to confine the investigation to bacterial peritonitis of specific origin. Only patients with perforated or gangrenous appendicitis were selected because the morbidity is consistently high following these complications of appendicitis. The present study included a group of 52 patients who were seen from 1955 through 1957 and in all of whom the presence of perforation or gangrene of the appendix was established by inspection at the time of laparotomy. This series was compared with a series of 78 cases treated during the period from 1950 to 1954 in which the presence of perforation or gangrene was established by a review of the operative records and the pathologist's gross and microscopic description of the removed appendix.

In the recent series 500 c.c. of a solution containing

1 mgm. of terramycin per ml. of lactate Ringer's solution were given through a small polyethylene catheter intraperitoneally every 4 hours. This therapy was continued from 24 to 36 hours.

In the 78 patients comprising the 1950 to 1954 control group there was one death, a mortality rate of 1.2 per cent. In the recent series there was one death, a mortality rate of 1.9 per cent. In the control group there were 12 patients or 15.4 per cent in whom an intraperitoneal abscess requiring surgical drainage developed. This compares with 5 patients in the treated group, 9.6 per cent, requiring surgical drainage. Of the control patients an inflammatory mass which spontaneously subsided developed in 12 or 15.4 per cent compared to 11 or 21.1 per cent in whom a mass developed in the treated group. There was no apparent significant difference in duration of temperature elevation, ileus, or length of hospital stay in the two series.

The authors found no signs of chemical peritonitis or toxicity due to administration of the terramycin intraperitoneally. It is the authors' feeling that the treated series in general, represented a more severe disease than that of the control group and that the reduction from 15.4 to 9.6 per cent of abscesses requiring drainage represents a significant achievement. No significant difference in the frequency of wound abscess was noted in the two groups.

—*John H. Schneewind, M.D.*

Peritoneal Cysts; Clinical Contribution (Cisti del peritoneo; contributo clinico). RENATO LUISE and ANTONIO DEMETZ. *Fracastoro*, 1958, 51: 99.

THE AUTHORS classify peritoneal cysts, on the basis of pathological characteristics, as true cysts, pseudocysts, and parasitic cysts. Peritoneal cysts are rare, their incidence being somewhere between 1 in 1,000 and 1 in 10,000 laparotomies. There is no significant sex preference and they seem to be more frequently observed before the age of 30 years. The most common site is the mesentery of the ileum, particularly in the vicinity of the ileocecal valve. The pathogenesis of the true cysts is still the object of much controversy. The authors are inclined to favor the theory of congenital origin.

The authors present 9 cases of peritoneal cysts, observed since 1946 among a total of 20,000 admissions and 13,000 surgical interventions in the Department of Surgery of the University of Padua. The 9 cases included 6 true cysts (4 lymphatic and 2 dermoid), 2 echinococcic cysts of the greater omentum, and one pseudocyst of the mesentery. Six patients were females and 3 males, ranging in age from 24 to 54 years. Three of the 4 cases of lymphatic cysts reported by the authors had a past history of pleural effusion. The cysts were located in the mesocolon in 2 instances and in the mesentery and posterior peritoneum in the other 2. In one of the patients another lymphatic cyst was removed from the mesentery 3 years previously.

Lymphatic cysts are usually unilocular, smoothly lined by peritoneum on the outer surface and by endothelium on the inner surface. They vary in size and may contain up to several liters of fluid.

Although the authors did not encounter any serous cyst, they point out that the major difference from the lymphatic type is in the inner layer which is lined by low epithelial cells. Dermoid cysts have a different consistency and color and are histologically entirely similar to dermoid cysts observed elsewhere. They are rather rare and more commonly found on the posterior peritoneal wall, although the 2 here reported were located in the mesoappendix and in the anterior peritoneum.

The authors describe the main features of other cysts, namely those originating as embryonal displacements of the duct of Müller and Wolff and as remnants of the omphalomesenteric duct. They also include, in their survey of true cysts, the so-called gaseous cysts, which are characterized by a fibromuscular wall and by a necrotic or inflammatory inner surface, without a well defined epithelium. These cysts are filled with gas and their etiology is most controversial.

Echinococcus cysts, single or multiple, are observed anywhere in the peritoneum, although the peritoneal location of such parasitic cysts is very infrequent and usually heterotopic and secondary to peritoneal implantation. Two instances of echinococcus cysts are reported here, one unilocular and the other containing many daughter cysts. Pseudocyst, finally, is a term used to indicate a cystic formation resulting from trauma, hemorrhage, or inflammatory processes in the lymph nodes.

The clinical manifestations of peritoneal cysts are nonspecific. Early lesions are silent and often discovered accidentally. Symptomatic manifestations, primarily pain and digestive disturbances, are caused by the location and the size of the cyst and slowly increase over a number of months or years, although, occasionally, torsion or rupture may be the first manifestation of their presence. Preoperative diagnosis is difficult, particularly when the size of the cyst is too small to offer unquestionable findings on physical examination. In the authors' experience, roentgenological studies of the gastrointestinal and urinary tracts and retroperitoneal pneumography have been helpful in localizing the cysts.

—*Franco Sangalli, M.D.*

Personal Technique and Results in Femoral Hernia Repair; Report of 39 Cases. AMOS R. KOONTZ. *Ann. Surg.*, 1958, 147: 684.

FEMORAL HERNIA is rare; it occurred in only one in 2,277 hospital admissions in a previous study made by the author. The recurrence rate is high, around 10 per cent, and is higher for the inguinal operation than for the low (Bassini) operation. The recurrence rate for strangulated femoral hernia is still higher.

It has been demonstrated in the author's series and from a review of the literature, that at least a third of femoral hernias become strangulated sooner or later if operation is not performed. Furthermore, the mortality rate in strangulated femoral hernia is high, running from 10 to 50 per cent in most of the series reported. Therefore operation should be performed early.

The femoral or Bassini repair consists of an incision over the femoral canal and after isolating, reducing, and excising the sac, the femoral canal is closed by suturing the pectineus fascia to the falci-

form process and Poupart's ligament. The Bassini repair is the operation of choice for primary femoral hernias.

The inguinal operation closes the femoral canal by suturing Cooper's ligament to Poupart's ligament. This operation has a defect in that it consists of suturing a semirigid ligament (Poupart's) to a completely rigid ligament (Cooper's). Because of the tension, these sutures may not hold. Lotheissen, in 1898, sutured the conjoined tendon to Cooper's ligament and took off the tension by a relaxation incision in the rectus sheath. The inguinal approach is advantageous in dealing with strangulated or incarcerated hernias. Resection is much more easily carried out. The author believes it to be the method of choice in recurrent femoral hernias.

Several other less commonly used approaches for the repair of femoral hernias are also described. Thirty-nine cases are reported in this series of which 18 were primary femoral hernias; the remaining cases had recurred from one to four times. There was one fatality, a 77 year old female with grave concurrent diseases. There were 2 recurrences.

—*Ernest D. Bloomenthal, M.D.*

GASTROINTESTINAL TRACT

Studies on the Site and Mechanism of Gastrin Release. CLARENCE M. BAUGH, JOSE L. BRAVO, JAIME BARCENA, and LESTER R. DRAGSTEDT. *Arch. Surg.*, 1958, 76: 441.

IN THESE EXPERIMENTS, vagus-denervated Heidenhain pouches were prepared in dogs, and the effect of various operations on the antrum on gastric secretion was determined.

When the antrum was severed from the stomach and its mucosa excised, the musculature was then attached to a diverticulum of colonic mucosa. There was a decreased secretion in the pouch showing that the absence of antral mucosa prevents the usual stimulating effect on gastric secretion secured by transplantation of the antrum to the colon. Gastrin is not supplied by the antral muscle lined with colonic mucosa.

When the antral musculature was excised and replaced by musculature derived from the colon, gastric secretion decreased, as though the antrum had been removed. However, transplantation of this hybrid antrum, consisting of antral mucosa and colonic musculature, into the colon as a diverticulum increased the secretion of gastric juice from the Heidenhain pouch toward the normal level. Isolated Heidenhain pouches constructed from this hybrid antrum responded to the introduction of liver solutions or solutions of acetylcholine with vigorous secretion of gastric juice. Distention of the hybrid antrum, however, failed to provoke secretion. It is suggested that the cell which releases gastrin may be a modified nerve cell in the submucosa of the antrum.

—*Edmund R. Donoghue, M.D.*

Tubeless Gastric Analysis. M. A. DENBOROUGH, F. P. RETIEF, and L. J. WITTS. *Brit. M. J.*, 1958, 1: 1213.

THE AUTHORS have briefly reviewed the literature on tubeless gastric analysis. It is their opinion that the exchange-resin method has little value as a quantitative test of gastric acidity. Its role is primarily that of a screening test in the detection of diseases associated with achlorhydria, such as pernicious anemia and gastric carcinoma.

They found good correlation between the results of the quininium resin test and the single-dose histamine test meal. There was frank disagreement in 2 of 73 cases, and equivocal "low free acid" results in three. However, the authors considered the results of the azure A resin test unsatisfactory. Here 3 of 15 patients with free hydrochloric acid were missed, and there were two false positive results among 36 cases with no "free acid."

Thus they concluded that the quininium resin test is valuable as a screening method for patients with achlorhydria, but could not recommend the azure A method for the same purpose.

—*Stephen W. Carveth, M.D.*

Reliability of Tubeless Gastric Analysis in Presence of Complicating Diseases. THEODORE RODMAN, ARNOLD GUTMAN, and RALPH M. MYERSON. *J. Am. M. Ass.*, 1958, 167: 172.

ONE HUNDRED AND FOURTEEN PATIENTS were studied for the presence of free gastric acid by the intubation method with Töpfer's reagent and immediately thereafter by the tubeless gastric analysis technique using a cation exchange resin azure A compound. The patients were selected because each had a disease state in which the results of the tubeless gastric analysis might be questioned. The patients were divided into the following five categories for purposes of analysis: (1) those with liver disease, (2) heart disease, (3) kidney disease, (4) diseases of the gastrointestinal tract, and (5) miscellaneous diseases.

In the fasting state the patient was given 1.0 mgm. of histamine phosphate subcutaneously as a stimulant to gastric secretion. Forty-five minutes later a control urine specimen was obtained. A No. 18 Levin tube was then passed into the stomach and its contents aspirated and tested for the presence of free hydrochloric acid using Töpfer's reagent as an indicator. The tube was removed and the patient given 2 gm. of cation exchange resin azure A compound with 240 ml. of water. The urine voided during the 2 hours following the ingestion of the resin compound was collected as the test urine. This 2 hour urine was diluted to a volume of 300 c.c. and an aliquot compared with two color standards of azure A, one equivalent to 0.3 mgm. of azure A per 300 c.c. and the second equivalent to 0.6 mgm. of azure A per 300 c.c. If the color was more intense than the 600 mgm. standard, the presence of free gastric acid was inferred. If less intense than the 300 mgm. standard, the test was interpreted as indicating no free acid. If between the 300 to 600 mgm. standards, the test was interpreted as doubtful.

The authors present evidence which confirms the soundness of the premise of tubeless gastric analysis, that is, the release in the stomach at pH 3 or lower of a substance which will be absorbed from the small intestine and excreted by the kidney in detectable form. The validity of the test depends upon other factors as well. The conventional gastric analysis, although frequently uncomfortable for both patient and technician, does not require the functional integrity of

any other organ. The tubeless gastric analysis, however, assumes normal gastric emptying, standard absorption from the small intestine, uniform circulatory dynamics in transport of the dye, consistent handling by the liver and other organs, prompt excretion by the kidney, and complete emptying of the bladder. Complete pyloric obstruction precludes absorption of the dye from the small intestine. In patients previously subjected to gastrectomy, the resin compound may not be retained in the gastric stump long enough to permit release of the dye. There is a theoretical possibility that hypermotility might produce the same problem. The test has not been performed in a significant number of patients with the malabsorption syndrome. The role of the liver in the handling of azure A is unknown. In a group of 39 patients with varying degrees of hepatic failure, one false negative result was obtained. It occurred in a patient with far advanced hepatic cirrhosis with evidence of both chronic and acute hepatocellular damage. Far advanced renal disease was the one condition in which the authors found a significant incidence of false negative results. In the presence of severe renal insufficiency, an inadequate amount of the dye is excreted.

In the 114 patients studied, there were 4 in whom the results were false positive. The procedure itself, including testing the urine, is simple and requires little time or training. Tubeless gastric analysis will probably be most useful as a screening technique for the detection of gastric achlorhydria. Its simplicity makes it readily adaptable for use in large numbers of patients and as an office procedure.

—*Lloyd D. MacLean, M.D.*

Gastropexia Anterior Geniculata for Sliding Hiatus Hernia and for Cardiospasm. J. Boerema. *J. Internat. Coll. Surgeons*, 1958, 29: 533.

The author has operated upon 57 patients with sliding hiatal hernia of the stomach. The operation consists essentially in tacking down the lesser curvature to the anterior abdominal wall under considerable tension and closing the hiatal defect. The next step consists in tacking the upper portion of the greater curvature to the undersurface of the diaphragm so that a rather sharp bend is made between the upper limits of the greater curvature and the beginning of the esophagus, now pulled down into the abdomen. This procedure makes the "knee" that the author refers to in his descriptive title of the operation. According to the author's follow-up statistics, all patients were reexamined, and in only 2 cases was there any evidence of recurrence. Apparently, the procedure prevents the esophageal reflux of gastric juice, and the patients have no evidence of esophagitis. It is an operation which is rather easily performed, with low risk, and is tolerated by patients of all ages.

—*Harold Laufman, M.D.*

Rigid Segments of the Prepyloric Lesser Curvature (Les rigidités segmentaires isolées de la petite courbure prépylorique). Guy Albot, G. Berthet, F. Souyet, and M. Petkovic. *Presse méd.*, 1958, 66: 701.

A study of 600 cases classified as prepyloric lesions revealed 19 which met the clinical, radiologic, endoscopic, operative, and histologic criteria of the working diagnosis of an isolated rigid segment of the prepyloric lesser curvature. The causes ultimately established were: chronic gastritis (10), heterotopic benign tumors (3), carcinoma (2), benign ulcer (2), other (2).

The authors emphasize that their studies in no way modify the classical methods of diagnosis of carcinoma of the stomach. Prepyloric rigidity, they note, is more often benign than not, but its appearance demands every diagnostic measure to rule out carcinoma, especially in the instance of the persisting lesion.

The article is profusely illustrated with roentgenograms and photomicrographs.

—*Edwin J. Pulaski, M.D.*

Functional Disturbances of the Stomach and Duodenum in Gallbladder Disease. J. Tapiovaara and M. Siurala. *Acta med. scand.*, 1958, 161: 257.

Simultaneous x-ray examination of the gallbladder and stomach was performed on all patients reporting for an x-ray investigation of the gallbladder to the roentgenologic department of a city hospital. The results of the examination of the stomach and duodenum in patients with a pathologic gallbladder (108 patients) were compared with the corresponding findings in patients with a normal gallbladder (93 patients). In addition, the examinations were repeated one month later for 40 patients with gallbladder disease.

The following results were obtained:

1. A lack of symptoms in the stomach and duodenum was significantly less common in patients with gallbladder disease than in the controls.

2. Air bubble in the duodenal bulb occurred significantly more often in patients with gallbladder disease (70 per cent) than in the controls (22 per cent). The symptom persisted in spite of the disappearance of the physical and laboratory indications of gallbladder disease.

3. Emptying difficulties of the stomach and spasticity of the different parts of the stomach and duodenum were a more frequent finding in patients with gallbladder disease than in the controls. The difference, however, was statistically insignificant. Some correlation was found between the disappearance of the aforementioned signs and the progress of the gallbladder disease.

4. No correlation was found between the occurrence of postprandial distress and the presence of functional disturbances of the stomach. The results of the reexamination, however, suggest that there may be some correlation.

5. Peptic ulcer, diaphragmatic hernia, duodenal diverticula, and cascade stomach were no more common in patients with gallbladder disease than in the controls.

—*Frederick W. Preston, M.D.*

Primary Polyarteritis Nodosa of the Stomach and Small Intestine as a Cause of Gastrointestinal Hemorrhage. Herbert C. Lee and Saul Kay. *Ann. Surg.*, 1958, 147: 714.

The authors add polyarteritis nodosa to the possible causes of gastrointestinal bleeding. The pathologic lesion is a fibrinoid necrosis of the medium and small-sized arteries and arterioles. It is characterized by marked perivascular infiltration of mononuclear and

polymorphonuclear cells with eosinophilic cells predominating.

The cause is unknown, but it is thought to have an allergic basis and may be produced by certain chemicals, drugs, and proteins. Its occurrence in the gastrointestinal tract is rare and is manifested by pain and hemorrhage as well as the other usual gastrointestinal symptoms.

Among the 3 cases presented is the only known case of primary polyarteritis nodosa of the stomach. The gastric ulcer caused by the fibrinoid necrosis of arteries in the gastric mucosa was excised in a subtotal gastrectomy which was curative. The second case was one of polyarteritis of the stomach and jejunum and the third affected the ileum and jejunum. All the gastrointestinal lesions were excised with good effect.

—*Ernest D. Bloomenthal, M.D.*

Studies on the Mechanisms of the Activation of Peptic Ulcer After Nonspecific Trauma. JAMES C. DRYE and ARTHUR M. SCHOEN. *Ann. Surg.*, 1958, 147: 738.

THE AUTHORS and many other workers have reported previously on the activation of quiescent peptic ulcers with subsequent perforation or hemorrhage within a week after either accidental or surgical trauma. The occurrence of hypersecretion and the rise of concentration of hydrochloric acid after trauma in both nonulcer and known ulcer patients has also been reported previously.

Experiments in both dogs and human beings with the administration of cortisone failed to produce hypersecretion of hydrochloric acid or pepsin. Thus it is impossible for "cortisone ulcers" to be produced by cortisone depression of the normal healing process.

Peptic ulcer following trauma may be due, not to hypersecretion, but to the unbuffered normal or elevated concentration of digestive juices acting on the gastric or duodenal mucosa.

—*Ernest D. Bloomenthal, M.D.*

Total Gastrectomy for Benign Peptic Ulcer. J. A. BALINT and J. W. P. GUMMER. *Lancet*, Lond., 1958, 1: 1044.

THE AUTHORS review the histories of 12 patients operated upon since 1951 at the Central Middlesex Hospital, London, in whom a total gastrectomy was done for benign ulcer. All patients survived. In 9 patients, the operation was done for recurrent anastomotic ulceration; in the remaining 3 patients, the lesion was a gastric ulcer, mistaken for carcinoma at operation. The following operations were performed: 2 end-to-end esophagoduodenal anastomoses, 1 jejunal loop replacement with esophagojejunal and jejunoduodenal anastomoses, 3 end-to-side esophagojejunal anastomoses with end-to-side jejunojejunostomy, 4 Roux-en-Y reconstructions with end-to-end esophagojejunal anastomosis, and 2 Roux-en-Y reconstructions with end-to-side esophagojejunal anastomosis. The authors state that there is no doubt in their minds that patients who had the Roux-en-Y reconstruction have had the best results. This experience coincides with the analysis of patients with total gastrectomy, performed mainly for carcinoma. All patients in this series have had regular doses of vitamin B_{12} administered intramuscularly, and no instance of macrocytic anemia has been found among them. Iron deficiency anemia, however, is liable to occur; and these patients are treated in the same way as patients with this problem who have undergone partial gastrectomy, namely, the oral administration of iron.

From the authors' experience they believe that total gastrectomy, if done with a Roux-en-Y reconstruction, is a justifiable operation for patients with anastomotic ulceration not cured by an adequate partial gastrectomy and vagotomy, and even in patients with simple gastric ulcer in whom, at operation, the findings strongly suggest malignancy and in whom subtotal resection would not have given sufficient clearance. Adequate maintenance doses of vitamin B_{12} and iron, given orally, are essential for the well-being of these patients. The nutrition of patients with a Roux-en-Y reconstruction appears to be quite satisfactory. They can eat a normal amount of food and can maintain their weight.

—*Harold Laufman, M.D.*

Caloric and Protein Utilization Following Gastrectomy (Les taux caloriques et protéiques spontanément consommés par les gastrectomisés). S. BONFILS, J. TRÉMOLIÈRES, and A. MOSSÉ. *Arch. mal. app. digest.*, Par., 1958, 47: 245.

THE AUTHORS undertook to study the utilization of calories and protein foods in 30 patients who had undergone partial gastrectomy from 2 to 10 years previously.

Weight losses ranging between 10 to 25 kgm. occurred in 50 per cent of the group, and only 20 per cent of the patients maintained a normal preoperative weight.

A minutely detailed dietary history, obtained by dietitians, yielded reasonably accurate figures of the daily caloric and protein intakes of the patients.

By comparing actual with ideal weight and measured food intake with ideal diets the authors defined the relationship between faulty absorption of ingested food and diminished intake, or, as they phrased it, "denutrition."

Among the patients who lost more than 20 per cent of their ideal weight, the average reduction in caloric intake from ideal values was 49 per cent. This figure was almost identical with that calculated for a similar weight loss, after the manner of Keys in his studies on starvation, and supported the contention that weight loss after gastrectomy is almost entirely due to deficient intake rather than faulty absorption.

Functional disturbances such as the dumping syndrome and diarrhea occurred frequently (in 70 per cent), but were found as often among those with reduced intakes as those with normal ingestion. "Denutrition" follows insufficient caloric and protein intake. Poor eating habits, inability to eat frequently, excessive alcoholic intake, and high carbohydrate diets contribute to reduced intake.

In 10 patients accurate caloric and nitrogen balances were measured and 6 of these regained normal weight when proper caloric and protein intakes were consumed. In the 4 others, despite excellent ingestion, the weights never surpassed a subnormal level, as in a "constitutionally thin" individual.

—*John H. Wulsin, M.D.*

Late Prognosis After Partial Gastrectomy for Ulcer. URBAN KRAUSE. *Acta chir. scand.*, 1958, 114: 341.

LONG TERM FOLLOW-UP INVESTIGATION was done on 385 patients who had had two-thirds to three-fourths Billroth II partial gastrectomy for gastric or duodenal ulcer between 1905 and 1933. Patients dying in the early postoperative period were not included. The shortest interval following operation was 23 years and the longest 50 years.

Of the 361 traced patients, 210 had succumbed. Carcinoma of the gastric stump was the cause of death in 25 patients. According to official Swedish statistics, the expected mortality from carcinoma of the stomach would be 11.3 for a comparable population group without gastrectomy. The increase in these deaths in the series is statistically significant. Likewise, there was a significant increase in death due to tuberculosis among the patients who had gastrectomy. Twenty-four deaths occurred compared with 8.7 expected. The mortality from all causes was higher in this series with 210 actual deaths compared with 163.1 expected. Five patients died of jejunal peptic ulcer.

Analysis of the 151 surviving patients showed that the majority had a satisfactory result. Jejunal peptic ulcer had followed the operation in 5 individuals. Mild to moderate postcibal symptoms were recorded in 14 per cent. It was evident that the incidence and severity of postprandial symptoms decreased with age and the time elapsed following operation. Significant anemia occurred in a third of the survivors at some time. Iron, sometimes in large doses, was the most effective treatment for the anemia.

—Lockert B. Mason, M.D.

Late Inflammatory Complications After Gastric Resection (Entzuendliche Spaetkomplikationen nach Magenresektion). H. D. KRUSE. *Zbl. Chir.*, 1958, 83: 665.

THE INCIDENCE of inflammatory complications after gastric resections, such as subphrenic abscess, has decreased considerably, especially since the introduction of antibiotic therapy. However, late complications still occur. They are considerably more difficult to evaluate and diagnose because of the more protracted and almost symptom-free course of such late inflammatory processes.

A few of the author's cases are presented:

1. A 42 year old male had a gastric resection in 1952. In 1956 he was readmitted because of abdominal discomfort and tenderness. All examinations were negative except that of the white blood count (14.600), and a walnut-sized tender mass was found in the upper end of the incision. An exploratory operative procedure was performed and a large subphrenic abscess drained. After adequate drainage and redrainage the patient had an uneventful recovery.

2. In 1955 a gastric resection (Billroth II) was performed. A duodenal ulcer was found at surgery and an incidental finding, a solitary calculus in the gallbladder, was palpated. A few months after the surgery the patient was seen complaining about pain in the right hypochondrium. All studies were negative except that of a 22,000 leucocyte count and a roentgen-ray indication of an inflammatory process in the right costophrenic angle. Subsequently, air below the right leaf of the diaphragm was noted and a right subphrenic abscess was tentatively diagnosed. On exploration a necrotic gallbladder and a subphrenic abscess were found. The patient recovered after adequate drainage was performed.

3. In 1954 gastric resection (Billroth II) was done for a duodenal ulcer. The closure was performed with catgut (duodenal stump) and perlon (peritoneum). In 1956 re-exploration was done because of increasing gastrointestinal symptoms with weight loss, a white blood count of 23.600, and a palpable mass in the right hypochondrium. On exploration a tumorlike mass was found in the area of the duodenal stump. The apple-sized mass was biopsied. The pathological diagnosis was chronic periduodenitis. The mass disappeared within the next 6 months.

Case 1 illustrates the chronicity of the intraperitoneal inflammatory lesion, without any constitutional signs during the intervening years.

Case 2 presents the unusual occurrence of spontaneous necrosis of the gallbladder as a possible cause of the subphrenic abscess.

Case 3 shows the changing pattern of the present day antibiotic era in which productive chronic inflammatory lesions are no rarity. The author also considers the possibility of allergic reaction to the suture material.

Three cases were presented, illustrating the changing pattern of inflammatory postresection complications.

—Gunars Medins, M.D.

Intussusception: A Report of 148 Cases. BEN A. SHELTON, LUTHER A. BEASLEY, JR., and OSCAR F. NOEL. *Am. Surgeon*, 1958, 24: 395.

AN INTUSSUSCEPTION is defined and its pathology, diagnosis, and treatment are discussed. A study of 148 cases is presented. From this study, which covers a period from 1927 to 1957, the authors note a marked improvement in the mortality rate in the last 11 years as compared with the previous 19 years. In the previous 19 years the mortality was 39 per cent and in the last 11 years only 5.4 per cent. The cause of this decrease in mortality can probably be attributed to: (1) early diagnosis, (2) better surgical techniques, (3) better understanding of fluid balances, and (4) antibiotics. It is interesting to note that the sex incidence up to the age of 10 years is two to one in favor of the male after which the sex incidence decreases to a ratio of one to one. If this is a true observation, further studies are indicated to determine the cause. Associated appendectomy produces no increase in mortality rate.

—John J. Maloney, M.D.

Operative Decompression of Intestinal Obstruction by Long-Tube Jejunostomy. CLIFFORD J. STRAEHLEY, JR. and HERBERT D. GULLICK. *Surgery*, 1958, 43: 774.

DECOMPRESSION of the distended small intestine prior to surgery for mechanical obstruction is indicated whenever possible. Under certain circumstances, however, decompression by nasogastric intubation may not be successful. A noncooperative or irrational patient may either prevent the insertion of a tube or withdraw it once it has been passed. Rarely, the coexistence of pyloric or duodenal obstruction may preclude passage of a tube into the small intestine. In late obstructions the tube may not readily transverse

an atonic small intestine, and valuable time may be lost in futile attempts at intubation. In the presence of obstruction due to strangulation, operation must be performed without delay, hence without the opportunity for long-tube decompression. For these reasons the surgeon must always be prepared to deal effectively with distention of the small intestine at operation.

The wall of the obstructed intestine is often too thin and friable to be manipulated with impunity. A search for the obstructing point by uncoiling loops of distended bowel may inflict additional damage on the weakened intestinal wall and result in perforation and leakage. Primary resection and anastomosis of an obstructed, distended segment are fraught with danger since sutures will not hold in an edematous, thinned-out bowel wall. The evacuation of intestinal contents proximal to the obstruction restores tonicity of the bowel wall by improving its circulation and restoration of muscle tone of the bowel wall also promotes earlier resumption of normal intestinal activity and hastens the patient's postoperative recovery. For these reasons it is desirable that the contents of the obstructed small intestine be removed as completely as possible at the time of surgery.

The authors have devised and used a method of decompression of the small intestine utilizing long-tube jejunostomy. They believe this is preferable to any of the aforementioned enterotomy techniques because: (1) it is relatively atraumatic, since the enterostomy may be done in the highest or presenting jejunal loop before searching for the point of obstruction; (2) it effectively decompresses the entire small intestine in a few minutes' time through a single enterotomy; (3) it allows suction to be maintained at any desired level during the remainder of the operation and prevents pooling of intestinal contents near the operative site; (4) it permits a long tube to remain in the lumen of the bowel for continued decompression in the postoperative period and serves as an intraluminal splint which may prevent kinking of intestinal loops; and (5) when indicated in certain unusual circumstances, it may be utilized as a feeding jejunostomy during convalescence by simply adjusting the position of the tube.

The technique is as follows: a sterile, single lumen, long, intestinal tube with a mercury-weighted balloon (of the Cantor or Harris type) is introduced through a high jejunotomy either by means of a simple incision or through a trocar. Spillage is prevented by snug traction on a purse-string suture placed in the jejunal wall prior to making the enterotomy. Suction applied to the tube empties the most proximal jejunal loop. The additional length of tube is guided through the jejunotomy and, assisted by the weight of the mercury, passes into the next distended loop. As each loop is evacuated, it is gently gathered on the tube. Trauma to the intestinal wall is minimized since manipulation of the intestine involves only decompressed segments. Successively all loops of the intestine down to the point of obstruction are decompressed in this manner. The enterostomy is inverted around the tube with the previously placed purse-string suture. Omentum is interposed between the jejunum and abdominal wall. The proximal end of the tube is brought out through a stab wound in the left upper quadrant and fixed with a suture to the skin. Suction on the tube may be continued throughout the operation, and decompression is maintained postoperatively. The tube is removed when intestinal activity has resumed and decompression is no longer necessary. The jejunostomy closes spontaneously.

—*Benjamin Goldman, M.D.*

Postoperative Pseudomembranous Enterocolitis (L'enterocolite pseudomembranosa postoperatoria). LUCIO PICCINNI. *Ann. ital. chir.*, 1957, 34: 85.

PSEUDOMEMBRANOUS ENTEROCOLITIS, called also, diphtheric, antibiotic, staphylococcic, or necrotizing enterocolitis, was considered in the past merely as an autopsy finding. In the past year or so it has been reported as a clinical finding as well, following any type of surgery, but primarily in cases in which there has been widespread use of broad spectrum antibiotics.

The author reports two cases from the surgical clinic in Bologna. One patient had a gastric resection for duodenal ulcer, and the other a resection of a gastric polyp the size of a pigeon egg, an adenoma. The first patient died after 15 days and the second after 6 days. In both the broad spectrum antibiotics were used together with suprarenal cortex extract and chemotherapy. The onset of the pseudomembranous enterocolitis was ushered in by profuse diarrhea and circulatory collapse a few days after surgery.

The remedy of choice is neomycin and magnamycin and is given with the routine measures for combating shock, dehydration, and altered electrolytic balance. The absence of abdominal pain is characteristic. Stress is placed on the immediate stoppage of broad spectrum therapy and initiation at once of the aforementioned medication with the addition of erythromycin at times and also of steroid preparations, especially when stool cultures point to the presence of the Staphylococcus pyogenes aureus.

The cause of death is usually the massive involvement of the entire digestive tract, with membranous ulcerations that give rise to areas of destruction and perforation of the gut, in this instance the sigmoid. The studies made by the author prove that this serious complication became evident after the broad spectrum antibiotics began to be used universally in 1956 and 1957.

—*Vincent Ippolito, M.D.*

Natural History of Diverticulosis of the Colon. JOHN L. HORNER. *Am. J. Digest. Dis.*, 1958, 3: 343.

SINCE diverticulosis of the colon was first recognized several decades ago, considerable confusion has existed regarding the potential seriousness of this anatomic disorder. One reason for this disparity of opinion is that many of the reported series have emanated from hospital wards, and since only the most seriously ill patients are sent to a hospital, the statistics are obviously weighted. There would be less confusion about the serious sequelae of colonic diverticula if more were known of their natural history, and for this reason the experience of this author with patients seen in private practice and followed up closely through the years is reported.

The office records of all patients listed in the

author's files as having roentgenographic evidence of colonic diverticula were reviewed. There were slightly over 1,000 such patients. However, only those persons who have been followed up for at least one year were included in this series, leaving 503 cases to make up the statistics for this article.

In studying the age distribution of the patients with diverticulosis of the colon, it was found that the peak incidence occurred in the seventh decade, confirming the clinical impression that aging plays a role in the development of these miniature bowel-wall herniations. There was no sex predilection, 53 per cent being female.

The sigmoid colon was the sole site in 47 per cent of the patients, and was in combination with other segments in another 45 per cent. In other words some 95 per cent of the patients with colonic diverticula were found to have some or all of them in the sigmoid. In general, it was noted that diverticula develop last in the areas farthest removed from the rectum. In considering the predisposing factor for diverticulosis, the author postulated that if weakening of muscle fibers and increased intra-abdominal or intraluminal pressure influenced the development of diverticula, it might be expected that the incidence of concomitant hiatal hernias would be high. Such hernias were searched for in 292 of the present series and were found in 48 patients, an incidence of 16.3 per cent. In contrast, in a series of 100 patients in the 50 to 69 age group who had complete gastrointestinal roentgenographic examinations, and in whom colonic diverticula were not demonstrated, only 3 had hiatal hernias, an incidence of 3 per cent.

For the most part, symptoms have not presented any consistent clinical picture. When they were present, they were indistinguishable from the irritable-colon syndrome. Constipation and diarrhea were infrequent in this series.

The authors were interested in the phenomenon of progression of disease in these patients. One hundred and eighty-three patients had repeat examinations some time after the original diagnosis had been established by barium enema. These roentgenograms were carefully compared for indications of increase in number, size, and distribution of the diverticula. The conclusion reached was that one is not condemned to a relentless advance of this anatomic disorder once the diagnosis is established.

Of the 503 patients, 85 were observed in one or more classical attacks of diverticulitis. An additional 65 were considered by the clinician to have diverticulitis, despite the absence of one or more of the usual criteria. Using these figures, the incidence of inflammatory changes would range from 17 to 30 per cent, depending upon the accuracy of clinical identification of infection. Of those 300 persons who have been observed from 1 to 5 years, only 29 have been seen during an episode of infection, which is an incidence of 9.7 per cent. Of those 49 who have been followed up for 11 to 18 years, 18 have been seen in one or more attacks of diverticulitis, for an incidence of 36.7 per cent. This shows clearly that the longer a patient with diverticulosis coli is followed up, the greater is the likelihood of inflammation developing. Lest this give comfort to the advocates of routine bowel resection, it should be pointed out that a great many of these long-time patients have had only one attack of diverticulitis during the entire period of observation, from which they made rapid and uneventful recovery.

In this group the following complications occurred: gross hemorrhage 7 times, rectovaginal fistula once, perforation with peritonitis twice, and pericolic abscess 7 times. Two of the patients with pericolic abscess were operated on and both recovered uneventfully. This series demonstrates that properly managed diverticulitis rarely requires surgical intervention. It is to be noted that chronic obstruction and inability to rule out carcinoma, two universally recognized indications for surgery, did not occur. In only two or three of these patients has the question of intractability arisen. This is not to argue against the principle that interval segmental resection should be done on certain patients who have recurrent attacks of infection, as recommended by numerous surgeons. It only points out that such patients must be carefully selected.

—*Matthew H. Evoy, M.D.*

The Present Status of the Treatment of Chronic Ulcerative Colitis with Steroid Hormones. Bernard D. Resenak, Robert D. Pickett, Helen D. Van Vactor, James B. Hammond, and Others. *Gastroenterology*, 1958, 34: 879.

Because of the significant differences of opinion regarding the proper role and manner of use of steroid hormone therapy in ulcerative colitis, a survey by questionnaire was made of a large number of physicians who were actively engaged in treating ulcerative colitis. Accordingly, 324 members of the American Gastroenterological Association and 676 members of the American Proctologic Society were sent questionnaires regarding their experiences with the use of these drugs. Of the 1,000 questionnaires mailed, 261 were returned. Analysis proved that 226 of these provided useful information. A total of 157 physicians reported that they were using the steroid hormones and 69 physicians stated that they were not using them. Fifty-three and one-half per cent of the physicians who employed the steroid preparations used them in fewer than half of their cases of ulcerative colitis, and 40 per cent used them in more than half. Some alteration in the course of the disease was indicated in 103 replies, 73 of which stipulated that the general effect was favorable. Fifty replies revealed that no alteration in the course of the disease was noted and many added that some deleterious effects of this form of treatment were observed. The authors add their own results of treatment with corticotropin and the steroid hormones in 60 cases of ulcerative colitis.

There was general agreement that pituitary corticotropin and the adrenal steroid preparations were often beneficial in the treatment of chronic ulcerative colitis. The consensus of opinion was that large doses of corticotropin, until the acute symptoms had subsided, comprised the best initial treatment for this disease if hormonal therapy was to be used. There was no agreement as to whether maintenance therapy should be short or prolonged. The authors believe that the hormone treatment should be terminated within a reasonable time after control of the acute symptoms and emphasize the hazard of adrenal

insufficiency at the time of withdrawal of the medication after long periods. There was no agreement as to whether or not the usual complications of ulcerative colitis were affected by the use of the drug. There was some evidence that severe bleeding, perforation of the bowel, secondary infections about the anus, and giant ulcerations in the colon were seen more frequently in patients given steroids. It was concluded that the steroid preparations should not be used routinely in patients with chronic ulcerative colitis, but should be reserved for those with acute fulminating disease, those who are not improving on routine medical management, those who have complications such as arthritis and uveitis, and patients who must undergo surgical procedures, particularly if they have had a previous trial of hormone therapy.

—Edmund A. Gorvett, M.D.

Villous Adenomas of the Large Intestine; Clinicopathologic Evaluation of 50 Cases of Villous Adenomas with Emphasis on Treatment. MYRON W. WHEAT, JR. and LAUREN V. ACKERMAN. *Ann. Surg.*, 1958, 147: 476.

A REVIEW of 50 cases of villous adenoma covering a period of 45 years is presented; 41 of these cases are from the Barnes Hospital and 9 from other hospitals in St. Louis.

The villous adenoma of the large intestine is a tumor, usually occurring in the aged, composed of villi which project above the level of the surrounding intestinal mucosa. The villi are made up of fingerlike projections of loose supporting vascular stroma covered by a single layer of columnar epithelial cells. The epithelial cells of these villi are somewhat longer, more slender, and stain more darkly than the normal large bowel mucosal cells. They have darkly staining elongated nuclei and the outer portion of the cell contains less mucus than the usual epithelial cell. The differences are readily apparent at the junction of normal mucosa with villi.

These tumors have been subdivided into four groups according to what the authors have termed increasing degrees of malignancy on the basis of the microscopic appearance.

Group 1: Villous adenomas that appear completely benign.

Group 2: Villous adenomas with areas that show focal atypical changes.

Group 3: Villous adenomas with focal carcinoma. These tumors have focal atypical changes but also show small focal areas of carcinoma which are limited strictly to the mucosa.

Group 4: Villous adenomas with invasive cancer.

Villous adenoma is a tumor, predominantly of the rectum and rectosigmoid, which occurs in either sex and usually past the age of 50. The most common symptoms are blood and mucus from the rectum and/or loose, watery stools. The presence of a tumor can be detected in most cases by a single rectal or sigmoidoscopic examination. Since there is a 25 per cent chance that the most malignant zone of the tumor may be missed, multiple biopsies should be taken. Roentgenograms with a contrast enema are helpful and other tumors should be sought since these tumors are often found with multiple tumors or cancer.

Adequate local excision is sufficient therapy in the absence of malignancy or associated malignant tumors. If malignancy is present an adequate cancer operation is in order. The authors believe there is no place for such methods as biting out the tumors with a biopsy forceps, fulguration, wire loop cautery excision, local irradiation with radon seeds or radium needles, or external irradiation therapy.

In the authors' experience and that of other workers adequate local excision with the scalpel gives the best results in villous adenoma without invasive carcinoma. It prevents recurrence and ultimate deaths from malignancy. *—Edmund R. Donoghue, M.D.*

Anal Fistula; Background and Surgical Treatment. ROBERT TURELL. *N. York State J. M.*, 1958, 58: 1473.

THE AUTHOR describes anal fistula as essentially the final result of the progression of an acute anal abscess. He regards anal fistulas as contracted cavities of chronic anal abscesses in which the walls of granulation tissue fail to adhere to themselves. Anal fistulas are differentiated from anorectal fiatulas. The origin of inflammation or infection is usually in the preformed anal ducts and crypts.

Abscess is divided into four stages of development: (1) the "early or suspect"; (2) the stage in which the "abscess is declared"; (3) the stage in which the "abscess is evident"; and (4) spontaneous rupture of the abscess. Abscesses are drained and unroofed early and widely (Fig. 2), sometimes even on suspicion during the first stage. Certainly, there is little justification for a "wait and see" policy during the subsequent stages of abscess formation. Under certain conditions fistulectomy may be performed at the time of drainage and unroofing of the abscess.

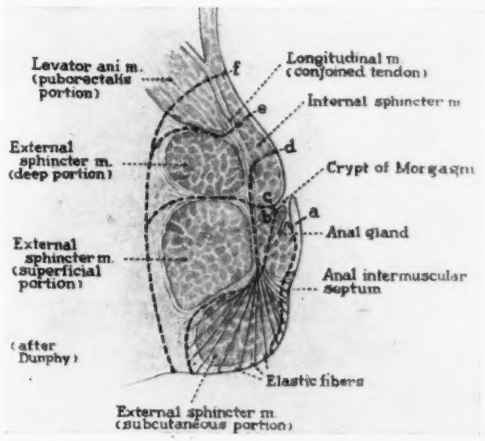


FIG. 1 (Turell). Note the pathways of anal fistulas (*a, b, c, d*) that may follow the anatomic course of the longitudinal muscle, which have originated in an abscess of anal crypt. Anorectal fistulas (*f* and possibly *e*) are usually the result of perforation of the rectum by colonic disorders, such as ulcerative colitis or tuberculosis or trauma such as a foreign body. Consult Goligher's newer studies on anatomy of anal sphincter musculature.

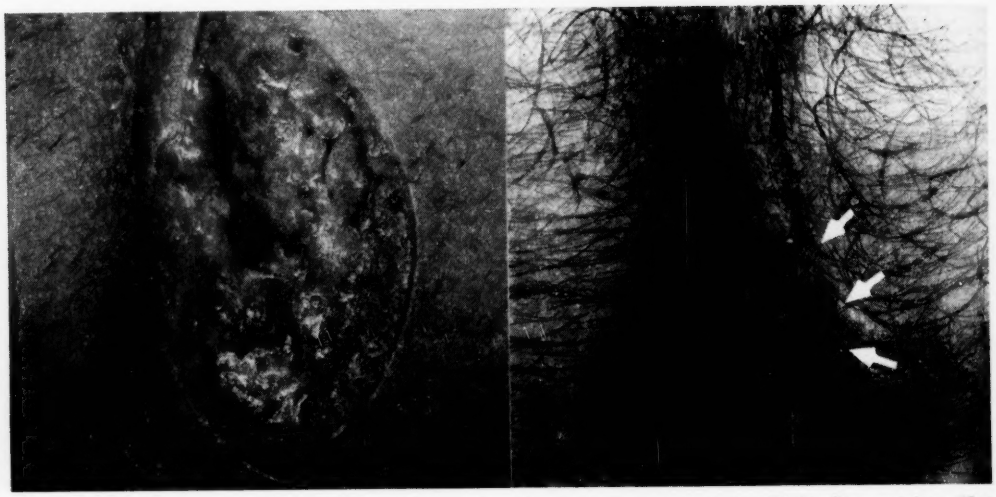


FIG. 2. Left, Example of wide unroofing with ample drainage of an abscess cavity. Right, Same patient. Note healed scar (arrows) 5 weeks after operation.

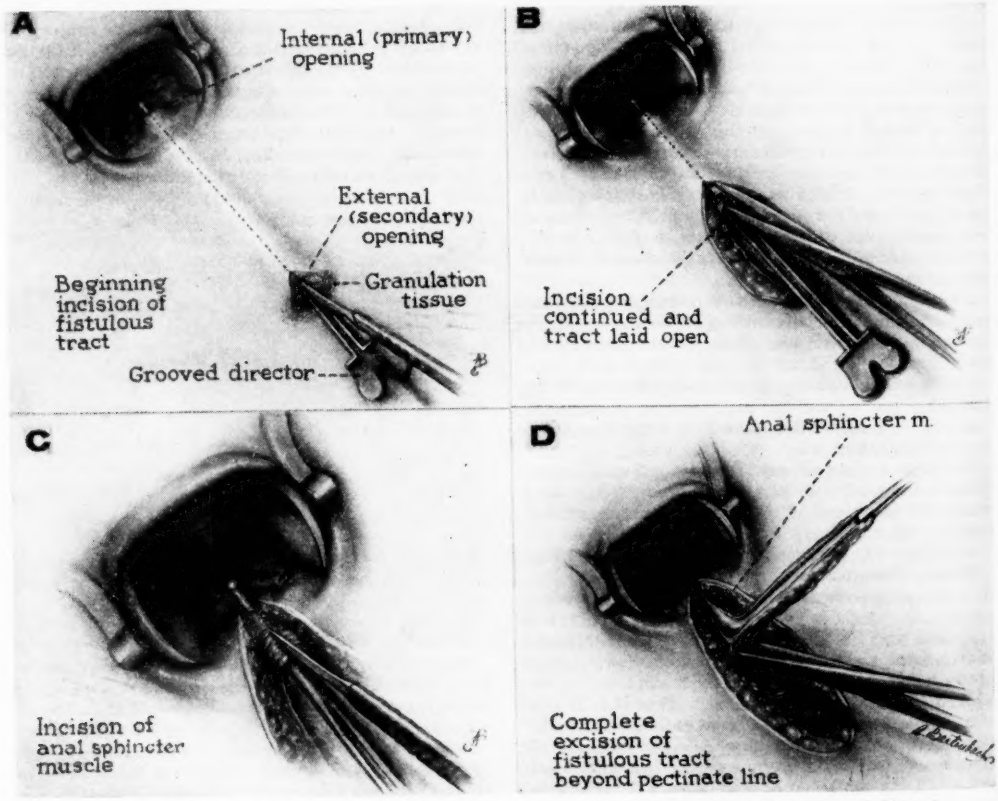


FIG. 3. Note the various steps of anal fistulectomy. A self-retaining anal retractor is employed (Fig. 4).

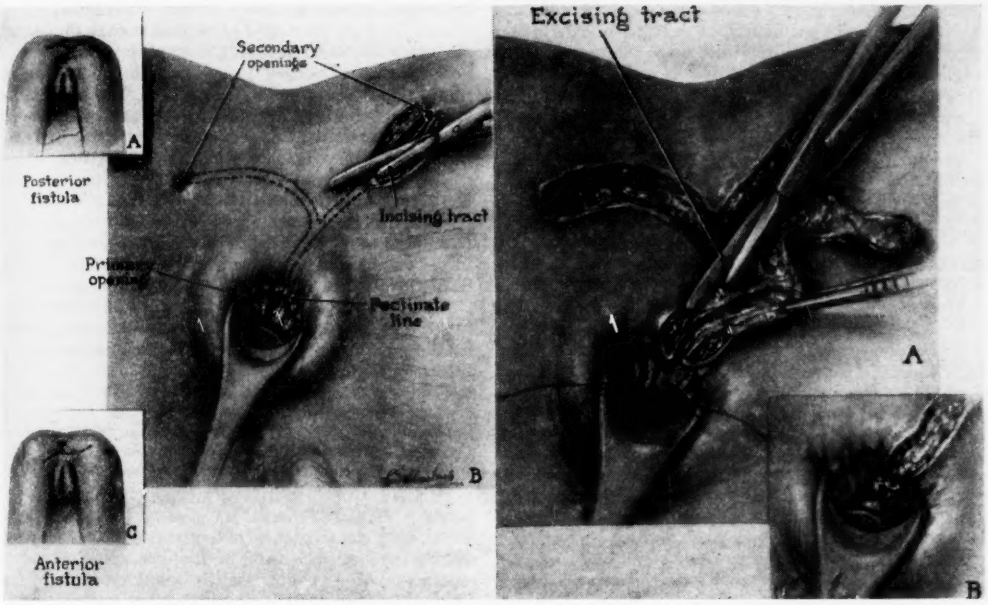


FIG. 4. Technique of fistulectomy for horseshoe anal fistulas. Note the use of the modified Hill-Ferguson anal retractor in place of the self-retaining anal retractor. The use of either instrument is indispensable.

The pathways of the development of anal and anorectal fistulas are depicted in Figure 1. Anal fistulas should be excised aggressively and completely (Figs. 3, 4). The fistulous tract should be opened from its source to its termination, regardless of the amount of sphincter muscle involved—a rule promulgated by John of Aderne more than 500 years ago—and excised (fistulectomy). Surgical timidity invariably results in incomplete disposition of the fistula. The author regards fistulotomy as an inferior operation. Mucoid or colloid cancer may supervene on untreated anal fistulas; these and epidermoid cancer may arise in fistulotomy wounds.

Some of the other facets of this problem, namely, examination, preoperative and postoperative management, anesthesia, technique, and complications are described in some detail. One of the newest postoperative features is the administration of dioctyl sodium sulfosuccinate (colace) in place of the conventional liquid petrolatum, which has been almost completely superseded.

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

The Topographic Anatomy of the Portal Venous System (Contributo allo studio anatomo-topografico del sistema venoso portale). A. BERTOLIN. *Chir. pat. sper.*, Milano, 1958, 6: 125.

THERE SEEMS TO BE general agreement in textbooks on anatomy, that in the majority of observed cases the inferior mesenteric vein terminates in the splenic vein. Only a few authors are of the opinion that the inferior mesenteric vein ends more frequently in the superior mesenteric vein. Several studies of this problem, reviewed in this article, seem to agree with the textbooks that termination of the inferior mesenteric vein in the splenic vein occurs more often than in the superior mesenteric.

The author, using a method of direct dissection, studied the portal venous system of 68 cadavers in order to determine the different ways of origin, and the variations in length and diameter, of the portal vein. On the basis of his observations he classified the variations in the confluence of the inferior mesenteric vein into five types. In type 1 the inferior mesenteric vein reaches the middle third of the splenic vein (8.7 per cent); in type 2 the vein terminates in the proximal third of the splenic vein (17.2 per cent); in type 3 it joins the portal vein at the angle between the superior mesenteric and the splenic veins (21.8 per cent); in type 4 the inferior mesenteric vein joins the proximal third of the superior mesenteric vein (39 per cent), and, finally, in type 5 it reaches the middle third of the superior mesenteric vein (13 per cent).

The author observed variations in the diameter and length of the portal vein, the distal part being wider, as a rule, than the proximal. The width was inversely proportional to the length of the vein. A progressive increase in length was noted in the portal vein from type 1 to type 5. In type 1 the vein was shorter and wider, especially at the origin, while in type 5 it was longer and narrower.

Two additional observations were reported in this

study. One concerned the variation in the angle formed by the splenic and portal veins, this being narrower in type 1 and wider in type 5; the other concerned the angle of confluence of the splenic vein with the superior mesenteric vein. As one proceeded from type 1 to type 5, a corresponding dorsalization of the splenic vein was observed.

The article includes 8 diagrams illustrating most of the observations reported and a table of measurements of the portal vein and its tributaries.

—*Franco Sangalli, M.D.*

An Evaluation of the Shunt Operation for Portal Hypertension. Lan Hsi-Ch'un, Tung Fang-Chung, Yao Ch'uan-Wen, Wu Sheng-Yi, and Ch'ien Chao-Eu. *Chin. M. J.*, 1958, 76: 315.

Portal hypertension is relatively common in China. In 124 patients undergoing surgery in this series, more than half of the operations were due to infection with schistosomiasis, which causes cirrhosis of the liver in its late stage. Males outnumbered females 4 to 1. The ages of the patients ranged from 7 to 61 years, with 74 per cent between 21 and 40.

The spleen was invariably enlarged, usually enormously so. Hypersplenism was present in 92.7 per cent. A barium meal study revealed esophageal or gastrofundic varicosities in 76 per cent. Bleeding was a symptom in 62.9 per cent, or 78 patients. Of these, 30 also had ascites. Ten other patients had ascites without bleeding. Cases with obstinate ascites are not considered suitable for shunt procedures.

The shunt was splenorenal in 95 cases and portacaval in 27. In one case the shunt connected the left renal vein and a tributary of the left gastroepiploic vein, and in another the splenic vein and a large tributary of the left renal vein. End-to-side anastomosis was preferred in splenorenal shunt and side-to-side in portacaval shunt, although one-third of the portacaval shunts were end-to-side anastomoses.

The portal pressure averaged 40 cm. of water at surgery before shunt, and was usually above 30 cm. The normal pressure range is 11 to 20 cm. of water. Splenorenal shunt produced an average pressure drop of 16 cm. of water, to a level still above the normal range in most patients. The average pressure drop for portacaval shunt with lateral anastomosis was 13 cm., and for end-to-side anastomosis, 14 cm. Most pressures were still above the normal range at the conclusion of surgery. The better pressure results with splenorenal shunt were contrary to other series, and are explained by the high proportion of markedly enlarged spleens in this series. Pressures measured after splenectomy averaged a 9 cm. drop, with the additional average of a 7 cm. drop after the splenorenal shunt was completed. In one patient, a tube was left in an omental vein and postoperative readings made. The portal pressure, which had been 32 cm. of water after the completion of the shunt, dropped to 14.5 cm. the first day and down to 9 cm. the second day. This is presented as evidence that the portal pressure probably continues to drop postoperatively, and that readings at the operating table are not a true evaluation of the effect of the shunt.

Postoperative coma or precoma occurred in 11 patients (40.8 per cent) of the 27 who had portacaval anastomosis, and in none of those with splenorenal shunts. Two patients died in hepatic coma. The overall mortality, early and late, was 9.7 per cent.

Postoperative follow-up examinations of from 5 months to 3 years and 10 months in 98 patients revealed recurrence of bleeding in 5.1 per cent. Three of these patients with recurrences had massive bleeding and 2 moderate bleeding. One patient died, a postoperative mortality thus far of only one per cent for recurrent bleeding, demonstrating the effectiveness of the shunt operation. Follow-up barium meal studies further verified this conclusion, indicating almost complete obliteration of the varices in 29 patients followed up 18 months after surgery.

Pancytopenia was relieved in 22 of 28 cases followed up after splenorenal shunt, no doubt as the result of the splenectomy. Portacaval shunt was ineffective in relieving pancytopenia.

—*Stanley W. Tuell, M.D.*

Studies on Portal Hypertension; Correlation Between Severity of Pathologic Involvement of the Portal System and Variations in Tension. Agusto H. Moreno, Louis M. Rousselot, and William F. Panke. *Surg. Clin. N. America*, 1958, April, p. 421.

Although the existence of a state of portal hypertension in cases of cirrhosis of the liver, splenomegaly, esophageal varices, and ascites was demonstrated in 1936, this concept still presents many obscure and apparently controversial issues. Although portal decompression has emerged as an effective treatment for esophageal varices, the effects of portacaval anastomosis on ascites, liver function, portal-systemic encephalopathy, and hepatic regeneration have not emerged as clearly from currently available information. The exact role played by obstruction, either intrahepatic or extrahepatic, in the development of hypertension and congestion in the portal bed still remains somewhat doubtful. The authors have undertaken a comprehensive study of normal and pathologic portal circulation in which the maximum number of variables known at the present time have been taken into consideration. Direct portal, splenic pulp, and occlusive hepatic vein manometric studies, portal venography, caval venography, circulation times, and hepatic blood flow determinations were expected to yield valuable information when correlated with clinical, surgical, and laboratory findings in an exhaustive study of a sufficient number of patients. This article is a report of the results obtained from the evaluation of the frequency and severity with which portal hypertension accompanied different degrees of pathologic alterations of the portal system in a group of 83 patients.

It was found that increasing severity in pathologic involvement of the extrahepatic portal system was directly proportional to the degree of portal hypertension. Patients with esophageal or gastric varices associated with hemorrhage usually exhibited the highest values in portal pressure with no readings lower than 340 mm. of water. Those patients with varices who did not bleed also exhibited high portal pressures but they were significantly lower than those in the patients who had hemorrhaged. All patients

with varices exhibited a well-developed state of portal hypertension.

It was also found that severe distortion or collateralization of the extrahepatic portal tree without esophagogastric varices was associated with significant increases in portal tension whereas the elevations in pressure were not statistically significant in cases of minimal to moderate distortion or collateralization. Splenomegaly was deliberately omitted as a criterion for portal involvement but proved to be in direct correlation with the degree of distortion and collateralization as well as with the extent of portal hypertension.

The authors question whether patients who have varices but have not bled actually represent an intermediate stage in the evolution of the pathologic process and if this obtains, it may be reasonable to presume that further increases in pressure with corresponding hemorrhage will ensue. Thus the indication for prophylactic portal-system venous anastomosis would evolve as a rational procedure.

—*James H. Holman, M.D.*

Factors Influencing the Reliability of Hepatic Turbidity and Flocculation Tests in the Differential Diagnosis of Obstructive Jaundice. LEE M. HERSHENSON, HOWARD M. RAWNSLEY, and JOHN G. REINHOLD. *Gastroenterology*, 1958, 34: 1146.

THE AUTHORS have determined that the newer and more sensitive flocculation and turbidity tests are as effective as the older less sensitive examinations in the differentiation of jaundice caused by obstruction and primary hepatic disease. One hundred and fifty-four patients with extrahepatic biliary obstruction who were seen over a 4 year period at the Hospital of the University of Pennsylvania in Philadelphia, Pennsylvania, were studied and the definitive diagnosis determined either at operation (152 cases) or necropsy (2 cases.) All patients had a total serum bilirubin exceeding 1.3 mgm. per cent before operation. Six turbidity-flocculation tests were done: (1) thymol turbidity buffered at pH 7.8; (2) the same at pH 7.55; (3) thymol flocculation at pH 7.8; (4) the same at pH 7.55; (5) cephalin-cholesterol flocculation read at 24 hours; and (6) zinc turbidity.

In 65 per cent of patients, all six turbidity-flocculation techniques gave results that were within normal limits. With either the turbidity or flocculation technique, buffering at pH 7.55 was found to be more sensitive than at pH 7.8. The thymol turbidity method was more sensitive than the thymol flocculation at the same pH. The pathologic nature of the obstructing lesion responsible for the jaundice was found to have no influence on the results obtained with these tests. Contrary to established opinion, ascending cholangitis did not significantly affect the results of the various turbidity-flocculation tests. Although the duration of jaundice tended to cause a larger proportion of abnormal function tests, the differences between groups were not statistically significant. Intensity of jaundice at the time of testing, however, did influence the results in a direct relationship, i.e., the deeper the jaundice, the greater the deviation from normal of the liver function tests. There was no correlation between the serum protein levels and the results of the turbidity-flocculation tests. There was also no significant degree of association between abnormal test results and the serum alkaline phosphatase concentrations.

Although the turbidity-flocculation reactions are, in effect, liver function tests, this is of secondary importance as an aid in the differential diagnosis of jaundice. Here the tests are used not to detect liver cell damage and not to distinguish the patient with obstructive jaundice from the normal person, but to separate obstructive jaundice from hepatocellular disease. The accuracy with which this may be done is inversely related to the duration and intensity of jaundice, although the exact time during which these tests become invalid or less valuable is not definite.

—*Harvey N. Lippman, M.D.*

The Physiological Basis for the Surgical Treatment of Jaundice. JOHN L. MADDEN. *Surg. Clin. N. America*, 1958, April, p. 447.

THE AUTHOR classifies and gives details of diagnosis and treatment of all abnormalities leading to jaundice that might be benefited by surgery. The differential diagnosis between intrahepatic or medical jaundice and extrahepatic or surgical jaundice is dependent on a detailed clinical history, the use of liver function tests, such as cephalin flocculation, thymol turbidity, bromsulphalein excretion, the alkaline phosphatase, and the prothrombin response to the administration of vitamin K. In many patients with jaundice of the intrahepatic type there is a prodromal period varying between 1 and 3 weeks, during which time the patient may complain of general malaise, headache, anorexia, intermittent nausea and vomiting, occasional diarrhea, and pronounced fatigue. A low grade fever and weight loss may also be observed. The liver function tests are of value only in the early phases of jaundice (less than 4 to 6 weeks). In patients with intrahepatic jaundice of the cholangiolitic type most of the liver function tests may be surprisingly normal. The correct differential diagnosis may be made only at the time of abdominal exploration. In the extrahepatic nonobstructive type of jaundice which is exemplified by the various types of hemolytic disease, the excess of urobilin and the absence of bile in the urine, and the normal color of the stools are common group characteristics. These characteristics differentiate the icterus caused by excessive hemolysis from the hepatic and posthepatic types of jaundice. In the extrahepatic or surgical type of jaundice, the onset of the icterus is usually abrupt and associated with either few prodromal systems or none at all. The most common accompanying symptom is abdominal pain. The jaundice in carcinomatous obstruction is progressive and unremitting, whereas jaundice due to stone is generally intermittent.

General factors in the treatment of all surgical cases of jaundice include the use of vitamin K, blood transfusions, a high caloric, high protein, low fat diet. The general preparation of the patient for operation should be completed as quickly as possible to prevent undue delay in the performance of the definitive operative procedure which is indicated. The presence of calculi in the bile ducts is considered an absolute indication for operation. The author uses a No. 12 French catheter regardless of the degree

of dilatation of the common duct and this is removed routinely on the fourth postoperative day. Prior to its removal, a cholangiogram is obtained both for the information which it supplies and its potential value in definitive comparative studies. Operative cholangiograms, although an important diagnostic aid, are not routinely obtained. Benign strictures of the common bile duct are predominantly caused by trauma to the duct in the performance of cholecystectomy. Detailed drawings of the author's technique of cholecystectomy are included and it is recommended to prevent damage to the common bile duct. The performance of cholecystostomy in cases of acute cholecystitis in which grave danger of injury to the common duct arises is recommended. Reconstruction of the common bile duct without the use of internal splints or stent supports has proved satisfactory.

In selected patients with the prospect of cure, the radical operation of pancreaticoduodenectomy with aortacaval node dissection is recommended for carcinoma of the head of the pancreas and for carcinoma of the common bile duct and other periampullary neoplasms. The palliative surgical treatment prescribed is either choledochoduodenostomy or cholecystojejunostomy in combination with an anticolic gastrojejunostomy which is performed in anticipation of subsequent pyloroduodenal obstruction. The ideal treatment of carcinoma of the gallbladder, like that of benign strictures of the common bile duct, is prophylactic. Gallstones are present in association with carcinoma of the gallbladder in an exceedingly high percentage of patients. Accordingly, in general, cholecystectomy is recommended in the treatment of calculous cholecystitis whether the patient is or is not symptomatic. The occurrence of jaundice secondary to carcinoma of the gallbladder is generally indicative of inoperability. Furthermore, the diagnosis is most often made at the time of operation and the lesion is rarely resectable. Carcinoma of the gallbladder spreads primarily by local invasion of the liver and regional lymph nodes. Because of this tendency to spread by local invasion, in selected patients right hepatic lobectomy may be the operation of choice. The extremely poor prognosis relative to the surgical treatment of carcinoma of the gallbladder is demonstrated by the fact that, in a recent collective review of a large series of reported cases, there were only 22 patients who had survived 5 years or more.

In cases of jaundice in association with acute pancreatitis or chronic recurrent pancreatitis treatment is dependent upon the operative findings. Basically, the common bile duct is explored and a cholecystectomy is done only if the gallbladder is diseased. If stones are found in the common duct, they are removed and the lumen of the duct is irrigated repeatedly with warm saline solution to flush out any residual or occult stones. A No. 4 Bakes' dilator is then inserted into the common duct and an attempt is made to pass it through the papilla of Vater into the duodenum. If this is readily accomplished, dilators of progressively increasing sizes are employed up to size 8. If a probe or dilator of small size cannot be inserted through the common duct into the duodenum, either transduodenal sphincterotomy or a choledochoenterostomy is performed. When a sphincterotomy is done, an attempt is always made to identify the opening of the pancreatic duct and insert a probe into its lumen. If this is successful, a ureteral catheter, No. 4, may be passed into the pancreatic duct and its opposite end passed upward through the severed sphincter of Oddi into the lumen of the common duct and out through the incision in its anterior wall. Serial roentgenographic dye studies relative to the pancreatic duct and its branches may then be obtained as the ureteral catheter is subsequently being withdrawn. If a choledochoenterostomy is performed, a side-to-side choledochoduodenostomy is preferred to either a side-to-side or a Roux en Y choledochojejunostomy.

—*Lloyd D. MacLean, M.D.*

Massive Right Hepatic Lobectomy with Amputation of Common Bile Duct for Alveolar Echinococcosis of the Liver (Hépatectomie droite élargie avec ablation de la voie biliaire principale pour échinococcose alvéolaire du foie). JEAN GROSDIDIER. *J. chir.*, Par., 1958, 75: 408.

THIS ARTICLE includes a case report of successful massive right hepatic lobectomy, with removal of the quadrate lobe and of the paramedian section of the left lobe (segment 4, Couinaud), followed by resection of a portion of the common duct found to be nonfunctioning because of the pathological process, and reestablishment of biliary continuity by end-to-end hepatojejunostomy.

A thoracoabdominal incision was made with a long extension through the diaphragm to within about 2 cm. of the vena cava. There was enormous enlargement of the liver with deformity of the right lobe due to what appeared to be 3 fist-sized tumors. The left lobe was found to be of normal consistency and smoothness, but enlarged to double the normal size and showing biliary stasis. Dissection of the hepatic root was extremely difficult and risky because of enormous scleroinflammatory infiltration necessitating literal sculpturing of millimeter after millimeter of the various anatomical elements. Finally, after 2 hours of effort, ligation of the right branches of the portal vein and hepatic artery was followed by deliberate sacrifice of the choledochus and the hepatic duct which were found to be compressed by scleroinflammatory infiltration. Following easy ligation of the right subhepatic vein, hepatectomy was performed. The weight of the specimen removed was 2½ kgm. The procedure was completed by the establishment of an end-to-end hepatojejunostomy and easy diaphragmatic and parietal repair, which was followed by abdominal and thoracic drainage. Postoperative recovery was paradoxically uneventful.

Icterus subsided within 15 days, and after removal of the transanastomotic drain, the patient was discharged, 3 weeks after surgery.

The pathologist reported an enormous tumor mass occupying almost the entire right lobe, whereas external visualization had given the impression of several dissociated parasitic zones. Histological diagnosis was alveolar echinococcosis.

Lortat-Jacob was the first to prove the possibility of survival after simple or massive right hepatic lobec-

tomy. Additional removal of the common bile duct and its reconstitution do not change this viewpoint; they only complicate the procedure.

The excellent results must be attributed to hepatic regeneration, which was particularly flawless in this case. The simple biliary stasis could not explain the volume of the remaining healthy parenchyma on the left, enlarged to at least double the normal size. The very slow destructive progress of the parasitic process was certainly responsible for this factor.

Alveolar echinococcosis is a relatively rare disease. Medical treatment is absolutely unsuccessful, and patients face certain death within a variable time. Surgical treatment, when possible, offers a certain degree of efficacy. Up to the present, a few cases of atypical wedge resection for very small lesions have been published. In most cases the clinicians were content with a simple biopsy and marsupialization or partial resection of the walls of a large intralobar cystic cavity after producing the confluence of several more or less necrotic parasitic zones. For lesions localized to one lobe, noted in 3 of 5 studied cases, anatomical dissection of the resected liver justifies the hope for cure in these patients.

—*Max L. Smith, M.D.*

Benign Cysts of the Liver and Biliary Tract. KENNETH W. WARREN and ROTHWELL C. POLK. *Surg. Clin. N. America*, 1958, June, p. 707.

CYSTS OF THE LIVER and biliary tract are frequently serious, since they may cause profound alterations in the physiology of the liver and gastrointestinal tract, and may lead to fatal complications unless properly treated. A knowledge of the types of cysts that may be encountered at operation is important in their differentiation and in selecting the best method of treatment. Failure to recognize the type of cyst that is present can lead to improper treatment with resultant serious complications or even death.

The authors review the more common congenital and inflammatory cysts of the liver, discussing the etiology, pathology, and treatment with case reports. Choledochal cysts or congenital cystic dilatation of the common bile duct require surgical treatment. In selecting the surgical procedure, one must realize that: (1) the "cyst" is in reality a tremendously dilated common bile duct with distal obstruction; (2) communications are frequently present between the cystic area and accessory bile ducts; (3) other congenital abnormalities often occur; and (4) the opening between the distal portion of the common bile duct and the duodenum can rarely be found. Adequate outflow of bile from the liver into the gastrointestinal tract must be established. A number of surgical procedures have been used for the treatment of this condition. Choledochojejunostomy is advocated by the authors with an enteroenterostomy proximal to the anastomosis.

The precise etiology of solitary nonparasitic cysts of the liver is not known; however, it is generally conceded that they are congenital anomalies which arise from faulty fusion of the ductal elements or from accessory bile ducts. Some of these cysts, however, appear to arise from congenital deformities involving the lymphatic areas, while others are of endothelial origin. Some have a histologic pattern suggestive of cystadenomas and these have been regarded as true proliferative cysts.

The proper treatment of these cysts is surgical. At the time of abdominal exploration, careful search of the abdominal and pelvic viscera should be made for other congenital anomalies. The location, extent, and precise anatomic relationship should be carefully appraised before any definite surgical maneuver is selected. Complete extirpation by enucleation or by partial resection of the liver is preferable. Radical removal of large cysts deeply situated in the parenchyma of the liver should not be selected until the anatomical pattern of the extrahepatic biliary tree has been determined. If the cyst approaches the hilus of the liver, the common bile duct should first be exposed and opened to demonstrate the relationships of the right and left hepatic ducts to the tumor and also to demonstrate a normal connection between the common bile duct and the duodenum.

In some instances it will be impossible or inadvisable to remove the cyst by enucleation or partial hepatectomy. Under these circumstances the cyst should be marsupialized. It should be borne in mind, however, that most of the cysts are multilocular and that marsupialization will frequently fail. Because these cysts frequently communicate with functional elements of the liver substance, no attempt should be made to obliterate them by injecting sclerosing substances or by irradiation.

Infestation by the parasite, Echinococcus granulosus, may produce hydatid cysts in the liver. The disease is rare in the United States, but is more common in other countries, particularly in areas where standards of sanitation are inadequate. It is a serious condition and the type of treatment must depend upon the situation found at operation. If untreated, a hydatid cyst may rupture and contaminate the entire peritoneal cavity, with fatal results. Large cysts should be marsupialized, and dilute formalin solution should be injected into the cystic cavity during the postoperative period. At operation, care should be taken to evacuate the contents of the cyst thoroughly, and to prevent contamination of the general peritoneal cavity. Smaller cysts should be excised intact. The morbidity is almost twice as great when the cyst is large and marsupialization is necessary. With early and adequate treatment, the prognosis is good.

—*Harold L. Method, M.D.*

Primary Carcinoma of the Liver; an Analysis of Clinical Features of 33 Necropsies with a Report of 3 Cases. M. V. DIVEKAR. *J. Postgrad. M.*, 1958, 4: 86.

PRIMARY CARCINOMA of the liver is not at all uncommon in Asia and Africa although it is rare in Europe and America. The author has studied necropsy material in 33 cases of liver cell carcinoma seen at the K. E. M. Hospital in Bombay, India, during the years 1925 to 1956. He presents an analysis of the clinical features of this disease with 3 illustrative cases.

The disease occurred with an overwhelming preponderance in males between 41 and 60 years of age. It is not uncommon in childhood, however, and has been recorded in the newborn. Infantile cirrhosis is very common in India.

Nausea, vomiting, and abdominal pain were common complaints. Pain in the right hypochondrium was the first symptom noted in 2 out of 3 patients. Hematemesis occurred in 5 cases; jaundice in 19. Ascites was noted in 22 of the 33 cases. Malignant cells were not seen in the ascitic fluid. In about half of the cases fever was noted and in 2 of these it was the presenting symptom. The liver was enlarged in 20 of the 33 cases. The spleen was moderately enlarged in only 13 cases.

Most of the patients died within 2 to 6 months of the onset of their symptoms; this is consistent with the findings of other authors. In the past, hepatic cirrhosis has been associated with primary carcinoma of the liver in as many as 87 per cent of cases. An incidence of only 33 per cent was noted in patients with bile duct carcinoma. In the author's series, roughly half of the patients had pre-existing hepatic cirrhosis.

Examining this relationship in another way, the author has found that 5.5 per cent of the patients thought to have hepatic cirrhosis were found to have primary carcinoma of the liver. The importance of dietetic deficiency is stressed. In this series almost all the patients were undernourished and came from a very low strata of society.

The symptoms of abdominal pain, distention, loss of weight, dyspnea, hepatomegaly, jaundice, and ascites should lead to the suspicion of carcinoma of the liver in all persons over 40 years of age. Patients with portal cirrhosis who deteriorate rapidly and have abdominal pain may very well have hepatic carcinoma superimposed upon their cirrhosis.

The following laboratory and radiologic studies may be of considerable help in establishing the diagnosis of primary carcinoma of the liver:

1. Liver function tests: Evidence of parenchymal disease is often associated with portal cirrhosis. Liver function tests, however, are not diagnostic of the underlying disease.
2. Roentgenographic studies:
   - A. Examination of the chest may reveal elevation of the dome of the diaphragm.
   - B. Flat films of the abdomen with diagnostic pneumoperitoneal studies may be of considerable help in demonstrating the size of the liver and the presence of nodules on its surface.
   - C. Contrast examinations of the gastrointestinal tract may exclude the possibility of gastrointestinal disease or may demonstrate displacement of the lesser curvature of the stomach by an enlarged hepatic tumor.
3. Liver biopsy: Needle biopsy of the liver may be of help, particularly when the tumor is located. A negative biopsy, however, is of no significance. Portal cirrhosis arouses suspicion. Needle biopsies carry a considerable risk of intraperitoneal hemorrhage.
4. Exploration: Surgical exploration with frozen section examination of apparent masses in the liver represents the best diagnostic approach. It also provides the only therapeutic approach presently available. Resection of localized tumors has been described and remains at the present time the only method available for treatment of this disease.

—*Harvey N. Lippman, M.D.*

The Pathogenesis of the Hepatorenal Syndrome. NIELS A. LASSEN and AAGE CHR. THOMSEN. *Acta med. scand.*, 1958, 160: 165.

A CLINICAL SERIES of 30 consecutive patients exhibiting the hepatorenal syndrome who were admitted to the Third Medical Department, Kommunehospitalet, Copenhagen, during the period 1949 to 1956 is analyzed. Acute renal failure developed in all of the patients as a complication of hepatic or biliary tract disease.

Two thirds of the patients had been in a state of shock with arterial hypotension when the renal failure started. Concerning the remaining patients, clinical information was often somewhat meager. It is quite possible, however, that some of these patients had been in a state of incipient shock, a suggestion supported by the demonstration of marked water and electrolyte depletion in several cases.

Liver tissue was obtained from 14 patients. There was no specific histological picture typical of the hepatorenal syndrome. In some cases the tissue was normal, in others usually slight changes were found, their nature depending on the primary disease.

Histological specimens of kidney tissue were obtained from 15 patients. The histological changes were fairly constant and similar to the tubular-interstitial changes which are known to be typical for acute renal failure caused by shock.

It is concluded that the renal affection in the hepatorenal syndrome is not caused by mysterious nephrotoxin, but more likely by renal hypoxia due to manifest or incipient shock.

Patients with septic cholangitis caused by occlusion of the common bile duct, and patients with complications following surgical intervention on the bile tracts, should be observed carefully for hypotension, dehydration, and electrolyte loss. Adequate therapy should be instituted on any suspicion of derangement, and not deferred until the development of pronounced symptoms. If the cause of the shock can be found it should be corrected.

The underlying disease of obstruction of the common duct should be treated conservatively until the renal function is recovered.

The mortality is high, 70 per cent, in this series.

—*Edmund R. Donoghue, M.D.*

The Technique and Results of Operative Cholangiography (Technik und Resultate der intraoperativen Cholangiographie). P. FUCHSIG. *Chir. Prax.*, 1958, p. 25.

THERE IS no unanimity on the routine use of operative cholangiography. Ogilvie, for example, stated in 1956 that operative cholangiography should be used, at most, once or twice a year. The author presents a case for operative, cholangiography and documents its usefulness by an analysis of 161 patients.

The roentgenogram is taken with the patient on a specially constructed table, which has the x-ray tube attached under it and an overlying wooden board; the x-ray plate is placed on top of the operative field making the technical aspect of the procedure more attractive.

In 33 patients there was no clinical indication for cholangiography and this was confirmed in 30 by a

normal cholangiogram. Three patients (9 per cent) were found to have common duct stones despite the fact that the cystic duct was narrow; the serum bilirubin was within normal limits, the past history revealed no jaundice, and on preoperative visualization with biligrafin, the duct was found to be normal in all 3 patients.

The second group analyzed was made up of 82 patients, all of whom had clinical indications for exploratory choledochotomy, such as a history of jaundice. In 40 per cent of the patients choledochotomy and common duct exploration could be avoided because of a negative operative cholangiogram. Out of the remaining 49 patients of this group, 26 had dilated common ducts but no stones, 10 had palpable stones, and in 13, stones could not be palpated. Stones were suspected on cholangiography in 5 patients, but no stones were found on surgical exploration (false positives); and in 5 cases stones were missed on roentgen examination and discovered upon exploration (false negatives).

Visualization of contrast material in the duodenum does not mean that no common duct stones are present. Stones which are less than 2 to 3 mm. in diameter are hardly ever visualized. When a dilated common duct is in evidence contrast material of lesser density should be utilized. A repeat roentgenogram after the injection of saline solution is one way of achieving this goal. The author never uses any radiopaque dye of concentration greater than 25 per cent for physical reasons, the mathematical formulation of which he underlines. —*Karel B. Absolon, M.D.*

Symptoms After Cholecystectomy. W. BURNETT and R. SHIELDS. *Lancet*, Lond., 1958, 1: 923.

SYMPTOMS continue or develop in 15 to 20 per cent of patients after cholecystectomy for stones. These symptoms have been termed the postcholecystectomy syndrome which is erroneus since the symptoms often precede cholecystectomy and are not constant enough to be regarded as a syndrome.

The cases of 200 patients who underwent cholecystectomy in a 6 year period are reported. One hundred and forty-one of the patients were traced, and 126 of the patients were interviewed. The remaining patients could not be traced. The follow-up was over a year in all cases.

One hundred and six patients (75 per cent) have been completely relieved of all preoperative symptoms. Fifteen patients (11 per cent) have been relieved of pain, but on detailed questioning have some symptoms of biliary dyspepsia. Twenty patients (14 per cent) have significant symptoms after cholecystectomy. In 18 of the latter 20 patients with symptoms, the cause is an extrabiliary lesion, most commonly a peptic ulcer. Only 2 patients have symptoms ascribable to the biliary tract.

The extrabiliary causes for postcholecystectomy symptoms would appear to be peptic ulcer, diaphragmatic hernia, angina, stenosis of the sphincter of Oddi, pancreatitis, and recurrent stone. Of the 20 patients who had significant symptoms following surgery in all but 2 the cause was extrabiliary. In 2 cases adhesions secondary to the operation appeared to have been the cause of the postoperative symptoms.

There was no evidence in this series of autonomic imbalance or so-called biliary dyskinesia.

In this series no gallbladder was removed unless it contained stones or was obviously diseased, and it is suggested that this may account for the low incidence of postcholecystectomy symptoms.

—*John H. Davis, M.D.*

Cystic Duct Remnant; A Cause of Biliary Distress Following Incomplete Cholecystectomy. TEUVO K. I. LARMI and GUSTAF FOCK. *Acta chir. scand.*, 1958, 144: 361.

THE AUTHORS report their series of 13 patients who had a cystic duct remnant following cholecystectomy, and in whom colicky pain and other symptoms were relieved by removal of the cystic duct stump. The symptoms of the "postcholecystectomy syndrome" may be divided into three groups: (1) those due to other causes than cholelithiasis, but not recognized or treated with the cholecystectomy; (2) symptoms due to incomplete cholecystectomy; and (3) those symptoms caused by a lesion of the common bile duct. The cases of this series belong to the second group. From the literature, 241 cases of postcholecystectomy distress attributed to a cystic duct remnant have been tabulated. Opinion differs as to whether a cystic duct remnant may cause postoperative symptoms, and lengths of 2 cm. to 0.2 cm. have been recommended as the proper distance from the common duct for ligation of the cystic duct.

All of the authors' 13 patients were women. Their ages varied from 19 to 63 years with an average age of 46 years, which compares very closely with cases compiled from the literature. Eleven patients had been initially operated upon for cholelithiasis, and 2 for cholecystitis. In 6 instances acute cholecystitis existed at the original operation, which may have provided difficulty in complete extirpation of the cystic duct. The chief symptom of all these cases with a cystic duct remnant was pain, occasionally colicky in type, and usually radiating to the back and right scapular area. It was often similar to the precholecystectomy pain. In only 4 patients was there direct continuation of the preoperative pain. The other women had a pain-free interval of one month to 5 years, averaging 2.7 years. Reports from the literature describe average pain-free intervals varying from 1.6 to 5.5 years in different series. In all patients of this series, colicky pain was provoked by greasy, fried, and other foods. Dull pain, "fullness," nausea, occasional emesis, and constipation were other symptoms frequently encountered. Transitory jaundice occurred in 6 patients, and indeed, jaundice appears to be the second main symptom noted in other reported series.

Intravenous cholangiography was the most useful diagnostic aid, and was performed in 9 cases, with visualization of a cystic duct remnant in 6. At reoperation, in none of these 13 patients were common duct stones found. In one case, good evidence of a new stone in a cystic duct remnant was obtained. Variations in the anatomical arrangement of the ducts, particularly in the manner of insertion of the cystic duct into the common duct were also observed, which also might explain the previous incomplete removal of cystic ducts. The authors concede that possibly not

all cystic duct remnants will give rise to symptoms. However, following removal of such a remnant, 9 of their patients became asymptomatic, 2 were improved but had occasional pain and vomiting, and one was too recent to assess. Accordingly, they conclude that a cystic duct remnant should be considered as an etiologic factor in postcholecystectomy distress. The proper treatment is surgical removal of the stump. When cholecystectomy is performed, care must be exercised not to leave any remnant of the cystic duct.

—*Emile L. Meine, Jr., M.D.*

Strictures of the Bile Duct. RICHARD B. CATTELL and JOHN W. BRAASCH. *Surg. Clin. N. America*, 1958, June, p. 645.

STRICTURE of the common bile duct is a dreaded complication of cholecystectomy and one which carries with it a high morbidity and an appreciable mortality. If, in the performance of cholecystectomy, certain precautions and safeguards are employed by the surgeon, this complication can in most instances be avoided. Most important of these precautions is a careful dissection of the structures at the hilus of the liver and their accurate identification before any vascular or biliary structures are interrupted. The surgeon must be aware of certain common anatomical abnormalities that are encountered in this area. These abnormalities include a short cystic artery which arises from a right hepatic artery in proximity to the cystic duct, a double cystic artery, and a cystic duct which empties into a right hepatic duct. The principles of repair of common duct strictures are those encountered in general abdominal surgery, an accurate mucosa-to-mucosa anastomosis between the bile ducts without tension, and the use of an inlying tube which prevents contraction of the anastomosis. The authors' best results have been obtained in those cases in which either a plastic procedure was done on the duct or an end-to-end anastomosis was made between the upper and lower ends of the duct. Their preference was an end-to-end anastomosis between the ends of the duct and insertion of a T tube within this anastomosis, the external limb of which is brought out through normal duct either above or below the anastomosis. The operative approach to the repair of these strictures is best accomplished by elevating the duodenum and the head of the pancreas and identifying the common duct gland, which leads the surgeon to the bile duct.

Of a series of 112 patients treated in the period from 1940 to 1947, most of whom have been traced for 10 years or more, 33 obtained a good or excellent result and 69 a poor result after their initial repair. After further repair in 64 patients, a total of 68 were free of biliary obstruction and 9 were alive but had a recurrence of the obstruction. Seventeen patients died in the postoperative period and 33 died of complications of biliary obstruction or of the operative repair. The authors found that if biliary obstruction were to recur following repair, in the large majority of cases it would do so in 3 years. It is the authors' impression that an eventual good result can be obtained in the large majority of cases if recurrent biliary obstruction is promptly treated by operative intervention.

—*Harold L. Method, M.D.*

The Left Hepatic Duct and Its Usefulness in Repair of Damage to the Common Bile Duct. OLLE HULTEN. *Acta chir. scand.*, 1958, 114: 355.

THE LEFT HEPATIC DUCT was anastomosed to the jejunum in the treatment of 6 patients with operative destruction of the common bile duct. There is often a 2 to 3 cm. segment of the central portion of the left hepatic duct lying free outside the liver or covered by only a thin layer of liver parenchyma. Inflammation and scar from previous operations may cause difficulty in locating the left hepatic duct. A cholangiogram is helpful in locating the duct. A needle is introduced deeply into the porta hepatis until a bile duct is encountered. The contrast medium is injected and a roentgenogram made. When the central portion of the left hepatic duct is located it is dissected free as far as practical. By means of a longitudinal incision in the duct several centimeters in length, a wide anastomosis is made between the duct and a loop of jejunum. Enteroanastomosis is used to prevent resistance to bile flow. Short term results are considered good in the 6 patients although one subsequently died of multiple liver abscesses.

—*Lockert B. Mason, M.D.*

Atresia of the Extrahepatic Bile Ducts Treated by Hepatogastrostomy; A 12 Month Cure (Atresie der aeussenen Gallengaenge, Hepatogastrostomie. Anhaltende Heilung noch nach 12 Monaten). J. GRIGORESCU, L. E. MARINESCU, and I. IONESCU. *Zbl. Chir.*, 1958, 83: 597.

ATRESIAS of the extrahepatic bile ducts consist of six types. In the first, fibrous strands replace the common hepatic ducts and the gallbladder. In the second type only the gallbladder is patent and it may be used for anastomosis if cholecystohepatic communication exists. In the third type the common duct is atresic and higher anastomosis may be feasible. Cholecystogastrostomy is the procedure of choice when the gallbladder is in communication with the common duct, only the distal part of which is atresic (type 4); such an anastomosis is made easier by the distended gallbladder. In the fifth type the hepatic ducts are atresic but the gallbladder is in communication with the duodenum via the common duct; in most such cases the gallbladder contains no bile and intestinal to gallbladder anastomosis is of no use. Atresia of the most distal part of the common duct, the sixth type, has the best prognosis.

The case reported concerns a 3 month old child with complete atresia of the extrahepatic biliary system. The authors discuss the various differential diagnostic points between the jaundice caused by biliary atresia and other icteric conditions occurring in the newborn. Laboratory studies are essential, as cases of icterus gravis of the newborn may simulate an obstructive type icterus. The second condition in the newborn which is often confused with extrahepatic, obstruction is that produced by biliary thrombi; jaundice caused by this condition will gradually subside. Jaundice caused by an atresic bile passage will increase in intensity, and somnolence, convulsions, and cutaneous bleeding may develop.

The most plausible explanation of the etiology of extrahepatic bile duct atresia is replacement of the

bile ducts by fibrous strings secondary to epithelial proliferation, which occurs in the fifth to tenth week of development. A true aplasia is not on hand in such cases; it is rather a failure of recanalization.

The surgical procedure used by the authors on their patient was a gastrohepatostomy; the fundus of the stomach was anastomosed to the cut surface of the left lobe of the liver. The lateral margin of the left lobe of the liver was first amputated, then fish-mouthed, and a flap of omentum interposed into the anastomotic line between the liver and stomach. The prognosis of the patient treated by the authors should be excellent; he has been followed up for 12 months and has remained in excellent health with no evidence of jaundice or other disability.

Gohrbandt, who performed an anastomosis of an intrahepatic bile duct and the stomach in an adult in 1932, reports (*Zbl. Chir.*, 1957, 82: 161) that the idea for this procedure stems from Langenbuch, who performed this operation with success on 24 patients.

Two essential factors come into play in the therapy of bile duct atresia: the anatomical situation, which determines operability or the type of procedure, and the functional condition of the liver at the time of surgery. —*Karel B. Absolon, M.D.*

Postoperative Changes in the Normal and Pathologic Common Duct (Postoperative Veraenderungen des normalen und des pathologischen Choledochus). E. KAISER. *Helvet. chir. acta*, 1958, 25: 5.

DILATATION of the common duct after cholecystectomy is commonly accepted as fact. It was suggested that sphincter spasm is the cause and that no common duct dilatation occurs after sphincterotomy. The author investigated this problem in 507 cases of cholecystectomy.

The initial study included measurements of the diameter of the normal common duct. The preoperatively obtained values of the common duct diameter on roentgenograms corresponded closely to measurements obtained in anesthetized patients during operation, and to those obtained postoperatively via a T tube. Ninety-five per cent of the ducts were less than 1 cm. in diameter with only a few measuring 8 to 10 mm. in diameter; a diameter less than 4 mm. was hardly ever seen.

The residual biliary pressures were determined in 339 patients with a normal common duct. A residual common duct pressure is one which the sphincter of Oddi "can just withstand." Ninety per cent of the patients had a pressure of 8 to 16 cm. of water; 8 patients had lesser pressures down to 5 cm. of water and 27 higher pressures up to 30 cm. of water.

The intraductal pressure and the common duct diameter seem to depend on constitutional factors, but can, however, be influenced by stimulation from adjacent organs and through autonomic channels; such a mechanism was suggested for the 10 per cent of patients who deviated from the "normal" as to diameter and pressure

Of 69 patients with common duct stones or papillitis, pressures were within normal limits in some and increased in others; the increase above the normal level was in direct relation to the magnitude of the stenosis. Marked common duct pressure elevations are rather rare in cases of papillitis. In obstructions due to stones pressure elevations are of varying intensity and vary even in the same patient from time to time. Cases due to carcinomatous obstruction show constant and high intraductal pressure values.

In 30 patients, pressures within normal limits were shown shortly after clearing the common duct of stones, (one exception proved to be a highly nervous female). In cases of papillitis after sphincterotomy or dilatation of the papilla the pressures were very low for the first 24 hours, but subsequently rose to normal limits. The suprapapillary musculature of the common duct seems to act as an "Ersatz"-sphincter even a few hours after surgery.

No changes were observed in the diameters of preoperatively normal common ducts on biligrafin cholangiograms taken 6 months to 2 years after cholecystecomy and compared with operative cholangiograms.

After choledocholithectomy without manipulation of the sphincter, no dilatation of the common duct was ever noted. It must be kept in mind that with a T tube in place, a tendency to spasm will be noted; this can be relieved by 1 per cent novesin. Phases of peristalsis must be differentiated from true sphincteric spasm.

If the papilla of Vater is dilated, edema of this area will be noted for 24 to 48 hours. A concentric narrowing of the sphincter area and mushrooming of the duodenal folds is the characteristic roentgenographic picture. This edema is of no physiologic significance since the residual pressure remains low, the outflow never is impeded, and the common duct never dilates. Edema subsides in 4 days, occasionally in 10 days.

In 35 patients with dilated common ducts due to obstructions caused by stones or stenosis of the papilla the ducts decreased in size after relief of the obstruction. If the common ducts were larger than 18 mm. or the dilatations were of long standing, complete regression to a normal diameter did not occur. The elastic spiral fibers of the common duct wall are probably responsible for these phenomena. Postoperative dilatation of the bile ducts appears only when there is an unrecognized obstacle, such as stones or stenoses, and in biliary dyskinesia.

After choledochoduodenostomies, insufficiency and lack of any sphincter mechanism are noted. A flat plate will reveal air in the biliary system, a finding which is rarely seen with sphincterotomies. This is of no clinical consequence, but recurrent cholangitides have been described. They did not occur in any of the author's patients. One referred patient had recurrent cholangitides possibly caused by a stone which was visualized at the anastomosis. The anastomotic site may close; an ulcerative inflammation and secondary stenosis may be the cause of such an obstruction. —*Karel B. Absolon, M.D.*

Section of the Sphincter of Oddi in Pathological Conditions of the Choledochoduodenal Junction. YNGVE EDLUND and BENGT JACOBSSON. *Acta chir. scand.*, 1958, 114: 262.

IN AN ANALYSIS of the results of sphincterotomy, 36 cases are reviewed in which sphincterotomy was performed at the initial operation in 17 instances and

as a secondary procedure in 19. In the latter group cholecystectomy had previously been done.

Of the 17 done at the primary procedure, sphincterotomy was necessary in 10 for technical reasons to remove an impacted calculus in the ampulla of Vater. Preoperatively the chief symptom in 5 was pain, in 4 was pancreatitis, and in 1 was jaundice. Follow-up, 6 to 18 months postoperatively, disclosed 7 to be symptom free and 2 to have suffered attacks of pain similar to those before operation.

In the 7 remaining cases of the primary group, stenosis of the choledochoduodenal junction was the indication for sphincterotomy. Preoperatively 4 of these had pain as their only symptom, 2 had recurrent pancreatitis, and 1 had jaundice. All patients in this group were asymptomatic 6 to 18 months following operation.

In the 19 patients in whom sphincterotomy was performed as a secondary procedure, cholecystectomy had been performed 1 to 19 years earlier in all and the common duct explored in 4. In 10 of these, intense pain which persisted despite long periods of conservative treatment was the indication for sphincterotomy. At reoperation, the papillary passage was narrow but otherwise not remarkable in 7 of the 10; and in one case indurated scar tissue around the suprapancreatic part of the common bile duct was found in addition to a constriction of the papillary region. Follow-up evaluation 2 to 4 years after sphincterotomy showed only 2 of the 10 to be entirely pain free.

In 5 of the secondary group, sphincterotomy was indicated because of pain combined with jaundice. At operation the common duct was distended in 3 cases, and in 3 there was a partial obstruction of the ampullary passage to exploration. In one patient, in whom a biliary fistula developed after the first operation, a total stricture of the papilla was found. All of these patients were symptom free at slightly more than one year postsphincterotomy.

In the remaining 4 patients, sphincterotomy as a secondary procedure was performed because of pain plus recurrent pancreatitis and jaundice. The common duct was found to be dilated in all of these cases, and the papillary passage was narrow in 3. At the follow-up examinations 6 months to 2 years later, 3 of these patients were symptom free, but one still had recurrent pain although there were no detectable acute episodes of pancreatitis.

There were no postoperative complications of severity in this series which could be attributed to the operation itself. In some of the patients a slight postoperative diastasuria was noted which did not affect postoperative recovery.

Histologic examination of the resected portions of the ampullary wall showed infiltration of inflammatory cells, connective tissue proliferation, and in some cases, muscular hypertrophy. The latter findings may provide an organic basis for the symptoms.

—*E. Thomas Boles, Jr., M.D.*

Spontaneous Internal Biliary Fistulas. Samuel F. Marshall and Rothwell C. Polk. *Surg. Clin. N. America*, 1958, June, p. 679.

Internal biliary fistulas, or abnormal communications between the gallbladder or biliary ductal system and internal organs of the body, occur secondary to pathologic processes that involve the gallbladder, bile ducts, stomach, duodenum, small intestine, and colon.

The authors have reviewed 41 cases of biliary fistulas that have occurred in patients who have not previously had surgical procedures on or near the biliary tract. Fistulas caused by gallbladder disease were much more common than those due to penetrating peptic ulcer, and occurred more frequently in obese women of the middle age group. Patients with fistulas usually presented a history suggestive of chronic disease of the gallbladder of long duration. Roentgenologic evidence of air or barium in the gallbladder or bile duct was diagnostic in the majority of cases. The morbidity and mortality following operation are much greater when a fistula exists. The authors believe that surgical correction of internal biliary fistulas due to gallbladder disease is indicated. Patients with fistulas caused by penetrating peptic ulcer may first be given a trial of medical management. The incidence of spontaneous internal biliary fistulas will be reduced by early diagnosis and treatment of chronic disease of the gallbladder and upper gastrointestinal tract. —*Harold L. Method, M.D.*

Spontaneous Internal Biliary Fistulas. Teuvo K. I. Larmi and Arto Sivula. *Acta chir. scand.*, 1958, 114: 425.

Of 2,266 patients, with nonmalignant biliary tract disease subjected to surgery over a 10 year period, 19 were found to have internal biliary fistulas. The fistulas were cholecystoduodenal in 16 cases, cholecystocolic in 2 cases, and cholecystogastric in one case. All were complications of calculous cholecystitis. The other causes of internal biliary fistula—peptic ulcer and cancer of the alimentary tract—are not discussed.

There were 15 women and 4 men in the series, with ages varying from 36 to 75 years. Many cases were accompanied by symptoms that did not suggest disease of the biliary tract. Pain was the most frequent symptom, usually present over a period of years. Dyspepsia from fried or fatty foods was common, frequently with nausea and vomiting. Constipation occurred in 7 patients, diarrhea in 4. A high fever had occurred at some time in 12. Jaundice occurred in 9, always coinciding with episodes of fever. In 3, the jaundice was attributed to stones; in 6, jaundice was the result of cholangitis. Symptoms of pyloric obstruction were present in 2 patients, symptoms of intestinal obstruction in 2 others. Significant weight loss occurred in 10 patients. A tender subcostal mass was palpable in 6 patients.

Oral cholecystography was carried out in 16 cases and in 8 of these the bile ducts could not be visualized. Stones were outlined in 3 cases and 2 revealed air in the bile ducts. On examination following a barium meal, there were 2 cases of duodenitis, 2 of pyloric stenosis, and in 2 cases the barium passed from the duodenum into the gallbladder fundus, with air trapped above the rounded barium shadow.

At operation, all gallbladders in this series were thick-walled and extensively adherent to adjacent organs. In 13 cases the gallbladder was shrunken and

in 6, swollen. Fistula diameters varied from a fraction of a millimeter to 2 cm.

Stones were present in the gallbladder in 15 cases, in the common duct in 2 cases, and in the fistula in 3 cases. In cultures of 7 fistulas, Escherichia coli and Klebsiella pneumoniae were most commonly present, were all sensitive to terramycin and aureomycin, and were resistant to penicillin.

Surgical treatment included closure of the fistula in 18 cases. Cholecystectomy was done when feasible, although because of debility or inflammation 7 patients had only cholecystostomy and electrocauterization of the mucous membrane of the gallbladder. The common duct was explored in 8 of the cholecystectomies.

Postoperative cholangiography was done in 3 cases, revealing a common duct stone in one. This shadow disappeared in 3 weeks with daily instillation of ether.

Following surgery, results were classified as good in 13 patients. Two patients had occasional slight pain. One required further biliary tract surgery and pancreatitis developed later. There was one death, due to pulmonary embolism on the third postoperative day, in a patient in whom the fistula had not been closed because of an extreme inflammatory reaction. The incidence of spontaneous internal biliary fistula may be dropping, due to the tendency toward early surgery for cholelithiasis. Spontaneous closure of such fistulas is rare. Severe ascending cholangitis and hepatitis with jaundice may occur. The most serious complication is intestinal obstruction, usually occurring at or proximal to the distal ileum. At any operation for internal biliary fistula, the bowel should be thoroughly searched for stones. The surgical mortality is higher than in uncomplicated biliary tract disease and early surgery is indicated to prevent complications.

—*Stanley W. Tuell, M.D.*

Spontaneous Internal Biliary Fistulas Due to Calculi (Fistules biliaires internes spontanées d'origine lithiasique). Basile Kourias and E. Tsoufis. *J. chir.*, Par., 1958, 75: 23.

Ever since 1886, when Roth invited attention to pathological biliary tract communications, this problem has interested clinicians as well. Courvoisier and Naunyn (Leipzig, 1890) and several other workers studied this complication and its consequences, and many interesting articles on this subject have been published during the last 30 years.

This article is concerned with biliodigestive or biliobiliary internal fistulas of lithiasic origin found in 44 cases, i.e., 3 per cent of 1,500 patients with cholecystitis treated at the Hôpital de la Croix-Rouge Hellenique, Athens, during the 20 year period 1937 to 1957. The 21 cases of internal biliary fistula of ulcerative origin represented a percentage of 32.5 of the authors' 65 cases.

A study of 32 cases of biliodigestive fistulas, including multiple fistulas (cholecystoduodenal, cholecystocolic, cholecystocholedochal) (Fig. 1), the association of external fistulas, and rare fistulas, is followed by a study of 7 cases of biliobiliary fistula.

In ordinary cases, cholecystectomy is generally done via a retrograde approach. This approach is not only impossible, but very dangerous in cases in which

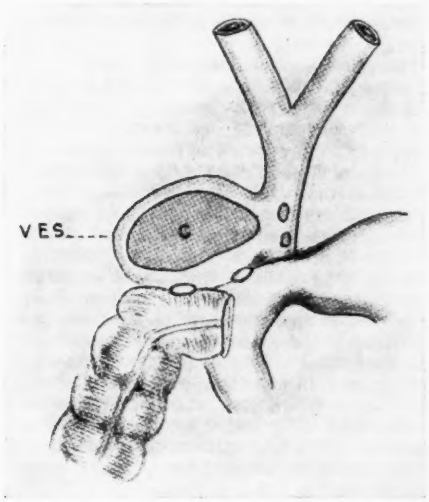


Fig. 1 (Kourias, Tsoufis). Multiple fistulas: cholecystoduodenal, cholecystocolic, and cholecystocholedochal.

identification of the biliary triad cannot be accomplished because of sclerotic infiltrations that tend to obscure everything. Such cases lead to major operative risks, especially when large impacted stones are partially within the hepatic duct. An anterograde approach, starting at the fundus of the gallbladder and continuing enucleation backward, is indicated in suspicious cases. Attention is invited to the necessity of inspecting the biliary triad by the endovesicular approach after incision of the gallbladder and removal of the stones in order to obtain easier and more accurate orientation. In 5 of the reported cases, identification of the large opening of the common bile duct fistula was made after removal of the calculi.

After the removal of calculi and the performance of other maneuvers on the biliary ducts, the remaining procedure includes cholecystectomy and drainage of the common duct or (much more rarely) establishment of a biliodigestive anastomosis.

Loss of hepatic duct wall substance, caused by the fistula, was reported to be considerable in 5 cases; in 2 cases leaving only the posterior wall of the hepatic duct, i.e., half of the entire periphery, intact. In these cases only, the vesicular wall is to be used for replacement of hepatic duct wall, with conservation of part of the vesicular wall. Even in cases of vesicular wall changes it is considered to be important not to be too hasty with total cholecystectomy. Ligation of the cystic artery should be done on a peripheral level near the line of the incision.

The first case of utilization of part of the vesicular wall for closure of the hepatic duct gap was recorded in 1946. The same procedure was subsequently employed in 3 more cases, whereas in 3 other cases total cholecystectomy was performed for different reasons.

In view of the major risk of ultimate stricture resulting in cases of loss of more than half of the periphery of the hepatic duct wall, insistence is placed on precise prophylactic operative measures.

Drainage at the end of the procedure is in most cases done with Kehr's method, seldom transpapillary. Prolonged drainage, at least 2 to 3 months, is reported to produce excellent results. Sphincterotomy is only to be done in those cases as indicated by the well known rules of biliary surgery. The necessity of an anastomosis between the hepatic duct gap and the duodenum or a nonfunctioning jejunal loop is considered to be rare.

Mortality (2 of the 7 patients who were operated upon died) appears rather high but explainable by the precarious condition of the patients, mostly of advanced age, with icterus as well as serious renal changes. With the present progress in medical experience, mortality has become lower.

Ultimate results depend on surgical experience and the exactness of operative techniques; however, in view of the particular measures to be decided upon during surgery, the method described in this article is recommended in order to obtain highly satisfactory ultimate results. The 3 surviving patients are reported to present no biliary symptoms.

—Max L. Smith, M.D.

The Problem of Postoperative Symptoms After Operation for Gallstones (Zur Frage der Nachbeschwerden nach Gallensteinoperationen). P. OLLINGER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 6.

IN this study the cases of 493 patients who had cholecystectomy with or without common duct exploration were reviewed. The mortality following uncomplicated cholecystectomy for lithiasis was 0.5 per cent. Complications, such as empyema, jaundice, marked adhesion formation, penetration or perforation into adjoining organs, raised the mortality figure to 1.04 per cent. Common duct exploration raised the over-all figure to 2.8 per cent.

Of the 74 icteric patients who were operated upon only 33 proved to have common duct stones. In the remainder, acute or chronic pancreatitis or cholangitis was found. Moreover, 21 patients without jaundice proved to have common duct stones.

Of the patients whose cases were reviewed, 48.8 per cent had symptoms less than one year in duration, 11.9 per cent less than 2 years, 4.4 per cent less than 3 years, and 34.6 per cent between 4 and 35 years.

Operative mortality in the jaundiced patients was 5.4 per cent. The mortality was zero in patients under 50 years of age. From these facts the author concludes that the earlier a patient with gallstones is operated upon the less likely is the chance that complications will develop, resulting in a lower mortality rate.

Three hundred sixty patients were traced from 1 to 8 years postoperatively; 79.89 per cent of them were free of symptoms. In 5.7 per cent the author concluded that residual symptoms could be attributed to other causes. Minimal symptoms were present in 10.8 per cent of patients. No further analysis of this group was undertaken. The author states, however, that in most instances the symptoms appeared to be less severe than those complained of preoperatively.

Finally, the group with marked postoperative symptoms showed recurrence of the preoperative symptoms within a few years following the original operation (3.5 per cent). In the 8 patients who came for reoperation, the following findings were noted: 3 patients had stones in the common duct, 2 had stenosis of the common duct following T tube drainage, 2 had cholangitis, and 1 had adhesions.

—Henry Gans, M.D.

Experimental Study on Traumatic Lesions of the Pancreas and Treatment of Its Cut-End. SHIGEKI NISHIDA. *Arch. jap. Chir.*, 1958, 27: 707.

THE AUTHOR has made an experimental study of traumatic lesions of the pancreas, the influence of drugs and food on the secretion of pancreatic juice and their relation to healing of the injured pancreas, and the course of healing of the injured pancreas. The author found that with superficial excisions of the pancreas the amount of pancreatic juice which escaped was negligible and there was prompt adherence of the greater omentum to the cut surface with immediate healing. In the cases of transection of the pancreas by wedge-shaped or longitudinal incision of the duct the postoperative intra-abdominal changes ordinarily were severe because the pancreatic juice escaped into the peritoneal cavity. The changes were further advanced when prostigmine was given to the animal.

In general, the course of healing following different types of lesions was similar and was usually favorable provided that the duct was not damaged. In case the duct was severed, the prognosis was grave. The administration of food or medication which promotes secretion of the pancreatic juice aggravated the postoperative condition. In the case of severe lesions, especially with extensive contusion, a transitory decrease of the secretions of the pancreas was encountered. In 24 hours, however, the pancreatic secretions increased and unless the open duct was treated surgically the prognosis was quite poor.

In the second part of this article an experimental study of treatment of the cut-end of the sectioned pancreas is discussed. The author believes that pancreaticoenterostomy is the method of choice for management of the cut-end of the pancreas. He states that when sclerosis or atrophy of the tail is pronounced, however, it is thought that a pancreaticoenterostomy is not always necessary. The other methods of treatment studied were mass ligation, ligation of the duct, and ligation of the duct plus interrupted mattress sutures. It is the author's conclusion that when a pancreaticoenterostomy is not done the method of choice is to ligate the pancreatic duct both on the duodenal and distal cut-end. Ligation of the duct with additional mattress sutures will cause rather marked necrosis of the corresponding part. Mass ligation may occasionally give rise to formation of fistula or cyst caused by autolysis of the ligated tip of the pancreas.

—John H. Schneewind, M.D.

Acute Pancreatitis; A Clinical Review of 72 Attacks Occurring in 54 Patients. PAUL L. SHALLENBERGER and DAVID F. KAPP. *Ann. Int. M.*, 1958, 48: 1185.

THE INITIAL DIAGNOSIS of acute pancreatitis to-day is missed in 65 to 75 per cent of cases. There is a multi-

tude of theories attempting to explain the pathogenesis and subsequent treatment. In order to avert sometimes disastrous surgery during the acute phase of pancreatitis, the diagnosis is of prime importance and must be made early and with certainty.

The present study is a review of all proved cases of acute pancreatitis observed at the Guthrie Clinic from 1940 through 1955. Only those cases with objective proof of diagnosis were included. One of the following was necessary for a proof of diagnosis: (1) elevated serum amylase, (2) elevated serum lipase, or (3) surgical or postmortem demonstration of either hemorrhagic pancreatitis or pancreatic fat necrosis. This series comprises 72 attacks in 54 patients.

Pain was the chief complaint in all of the cases. The pain was usually located in the mid- or right epigastrium. Nausea and/or vomiting were present in all but 9 attacks. Constipation or obstipation occurred in 19.4 per cent of the cases. No patient had diarrhea during an attack. Precipitating causes consisted of a heavy meal in 24 cases; 12 episodes followed excessive drinking. Examinations of the extrahepatic biliary tree in 44 cases showed that 21 had a normal patent biliary tree without stones, while 23 had evidence of past or present disease.

The possibility of pancreatitis was considered in 35 of 54 cases, but was the first choice in only 16. The two conditions most frequently confused with pancreatitis were acute biliary colic and perforated peptic ulcer. Fever, dehydration, and tenderness were noted in a considerable number of patients. A palpable mass was felt in 5 cases. Of the 72 patients 54 had a significant rise of serum amylase during the course of the pancreatitis and 27 of 35 patients had elevated serum lipase levels. Twenty-one of the 54 patients had elevated serum bilirubin levels during an acute attack of pancreatitis. While jaundice may have been caused by pressure from an edematous head of the pancreas, 17 of 21 patients exhibiting jaundice were subsequently proved to have a surgically correctible lesion of the extrahepatic biliary tree.

Of the 45 survivors, 9 (20 per cent) have become permanent diabetics. Any previously known nondiabetic who demonstrates either glycosuria and/or hyperglycemia combined with acute abdominal pain must be suspected of having pancreatitis.

Fifty-two attacks were managed solely by medical treatment with 5 deaths. Twenty patients were operated upon and 5 died. Patients requiring surgery after pancreatitis were exposed to two or three times the mortality and morbidity of medically managed patients. Ten patients had a total of 18 attacks of recurrent pancreatitis. When the diagnosis has been made with reasonable certainty, medical management is to be preferred. Medical management consists of: (1) correction of fluid and electrolyte balance, including blood transfusions; (2) relief of pain; (3) use of gastric suction, anticholinergics, and antacids; and (4) administration of broad spectrum antibiotics when indicated.

In summary, the authors place a special emphasis on the suggestive signs of the disease, the implications of jaundice, and the relatively high incidence of diabetes occurring as a complication.

—Alfred H. Noehren, M.D.

The Effect of Chronic Pancreatitis on Pressure Tolerance in the Human Pancreatic Duct. MERLIN K. DUVAL., JR. *Surgery*, 1958, 43: 798.

FOUR PATIENTS with cutaneous pancreatic fistula (3 from penetrating wounds, and one from resection of the pancreatic tail for gastric carcinoma) and 9 patients with severe chronic pancreatitis, who underwent retrograde pancreaticojejunostomy, were studied 4 days following surgery by measurement of pressures in a distal pancreatic duct catheter emerging from the abdominal wall. The splinting catheter had a 3 c.c. balloon with which it was possible to occlude the duct. With the patient in a fasting state, pressures were measured with a saline manometer and then perfusion pressure increased at a set rate. The point at which the curve broke suddenly was defined as the tolerance pressure. Fluoroscopic examination with diodrast indicated that tolerance pressure was equated with decompression into the duodenum.

The resting pancreatic duct pressures in the control group demonstrated a mean of 10.3 cm. of water and in the chronic pancreatitis group 28.3. The tolerance pressures were 17.6 in the controls with normal pancreas and 41.2 in the group of patients with chronic pancreatitis. These data suggest that in chronic pancreatitis, the intraductal pressure must rise to over twice the normal value before there is decompression into the duodenum. This would seem to indicate that partial obstruction is of some importance at least in the later stages of the disease. There may, therefore, be benefits from surgical decompression of the partially obstructed pancreatic duct.

—Hermes C. Grillo, M.D.

Therapeutic Neurotomy on Head of Pancreas for Relief of Pain Due to Chronic Pancreatitis; A New Technical Procedure and Its Results. HAJIME YOSHIOKA and TOSHISHIGE WAKABAYASHI. *Arch. Surg.*, 1958, 76: 546.

MANY PROCEDURES have been advised for the relief of pain related to chronic pancreatitis. Various operations have been performed on the autonomic nervous system for this purpose and include splanchnicectomy, sympathectomy, celiac ganglionectomy, and vagectomy combined with sympathectomy. The authors believe that dividing the nerve fibers at the point where they leave the celiac ganglion and just before they reach the pancreas is a better surgical method to control pancreatic pain; by this maneuver all the autonomic nerve fibers, including the fibers from the aortic plexus, may be sectioned while the autonomic innervation of the other abdominal organs is preserved.

The authors studied the anatomic relationship of the nerve plexus from the celiac ganglia to the pancreas and have presented a technical procedure designed to interrupt the autonomic nerve supply to the pancreas. They speak of this as the "plexus pancreaticus capitalis."

The autonomic fibers which enter the pancreas along with the splenic artery are not sectioned in this procedure.

A series of anatomic drawings is presented showing a plexus of autonomic nerves near the head of the pancreas and the operative procedure designed to

remove these autonomic pathways. The authors mentioned that they have treated 75 patients by this method and have obtained excellent results. The latter statement is an isolated one contained only in the summary of the article. —*Orville F. Grimes, M.D.*

The Mechanism of the Pathogenesis of Pancreatic Necrosis and the Therapeutic Effect of Propylthiouracil. L. Corsan Reid, Robert E. Paulette, Thomas W. Challis, and J. William Hinton. *Surgery*, 1958, 43: 538.

The disorganization of energy mechanisms in the liver, kidney, and heart was measured as shown by inhibition of oxygen uptake, by pancreatic homogenates, pancreatic mitochondria, and the microsome fraction of the pancreas.

The effects of crystalline trypsin, chymotrypsin, single and in combination, trypsin inhibitor, and various types of pancreatic juice upon similar preparations were compared.

Experimental pancreatitis was produced by the method described by Pfeffer and associates in a group of 12 dogs, one being sacrificed every hour for 11 hours and a second group of 12 dogs sacrificed at 21 hours which were used as controls to compare with 13 dogs similarly prepared, but receiving propylthiouracil and sacrificed at 21 hours.

The results of the action of pancreatic homogenates on the heart, kidney, and liver showed an enormous inhibition of oxygen uptake by the degradative enzymes in the pancreas which disorganized the oxidative energy organization in liver, kidney, and heart. The pancreatic mitochondria are much less inhibitory. Other experiments show very convincingly that these destructive enzymes are predominantly localized in the microsome fraction.

There was an absence of any action of crystalline trypsin and crystalline chymotrypsin and trypsin and chymotrypsin together as well as crystalline trypsin inhibitor on the oxygen uptake of kidney homogenates.

Various types of pancreatic juice had little or no effect on homogenates of liver and kidney. Vagal juice had the most inhibiting effect but less than pancreas homogenate and far less so than the microsome fraction.

Upon the addition of liver homogenates to kidney or heart homogenates or various combinations of these tissues, there is no such effect noticeable as when one adds pancreatic homogenates.

Propylthiouracil inhibits oxygen uptake in the homogenates of all organs and tissues.

In the group given propylthiouracil, 8 of 13 dogs had no evidence of pancreatitis except for some edema and congestion. The unprotected animals progressed to complete necrosis of the pancreas.

The authors believe that intracellular degradative enzymes destroy all inadequately irrigated pancreatic or other cells with which they come in contact. Trypsin and chymotrypsin play no significant role in this process.

Propylthiouracil inhibits the release of oxidative energy, less work is performed, less product is produced, less supplies are consumed, and as a result the gland is placed at rest when under stress. They recommend the chemical use of propylthiouracil in pancreatitis, as it has been shown to be beneficial in the delay and limitation of the necrotic process in the experimental lesion as compared to the controls.

—*Edmund R. Donoghue, M.D.*

Chronic Splenoportal Thrombophlebitis (Thrombophlébites splénoportales chroniques). R. Bourgeon, H. Piétri, M. Guntz, and J. Videau. *Mém. Acad. chir.*, Par., 1958, 84: 429.

Twenty-eight cases of chronic splenoportal thrombophlebitis form the basis of this report from Algeria. These fall into two groups, one with thrombosis in the course of massive splenomegaly, so common in Algeria, and the other with spontaneous thrombosis in young patients. Study of these patients with splenoportography and pressure measurements has revealed three stages of progression: a segmental hypertension in the splenic and mesenteric veins, the progressive development of collateral pathways, and, finally, hepatic damage from lack of splanchnic blood. No cases of congenital thrombosis of the portal vein have been observed.

Therapy is directed toward correction of hypersplenism when it exists, toward avoiding gastrointestinal hemorrhage, and toward reorienting the venous blood toward the liver. To this end, the authors advise, during the course of splenectomy or splenorenal anastomosis, that the veins leading to the esophagus be ligated (the short gastric, posterior gastric, and coronary) in order to redirect the blood flow toward the liver.

For the patients with thrombosis of the splenic and portal veins associated with a massive spleen, surgical intervention is dictated by such complications as hemorrhage, ascites, abdominal pain, and incapacitating splenomegaly. The extent of the thrombosis is determined by splenoportography and ileoportography performed at the operating table. Venous anastomosis is usually unsatisfactory, and the surgeon must decide between abstention, splenectomy with ligation of the derivative veins, and splenectomy with mesenteriocaval anastomosis.

The second and more interesting group of patients is characterized by gastrointestinal hemorrhage in the young group with a healthy liver. Instead of the congenital venous lesions of the portal vein so frequently described in the literature, the authors have found that inflamed lymph nodes about the porta hepatis have produced obliteration of the portal vein. In 3 cases tuberculous lymph nodes were responsible. In others, enlarged nodes, so common in childhood, were noted at the hepatic pedicle. One child of age 11 appeared with acute cholecystitis and later was found to have an inflammatory mass impinging on the foramen of Winslow and causing portal obstruction.

Therapy in the patients with primary splenoportal thrombosis depends on the stage of the disease. In the earliest phase when lymphadenopathy and inflammation impinge on the portal trunk the spleen enlarges slightly and hypersplenism becomes progressive. At this point, if collateral pathways have not become enlarged, splenectomy suffices. In the second stage when large dilated veins drain upward toward the esophagus, ligation of these ascending pathways, in addition to

splenectomy, is required to direct the venous flow inferiorly through collaterals to the liver and caval systems. If, however, the disease has advanced to the point that splenic vein pressures do not fall after completing this procedure, then splenorenal or mesenteriocaval anastomosis must be performed. However, unless the large ascending collaterals also are divided, the flow of blood will still be toward the esophagus, the point of least pressure, and the anastomosis will thrombose. Proper surgical measures at this stage will prevent progression to the final phase of liver damage and intrahepatic portal obstruction.

—*John H. Wulsin, M.D.*

MISCELLANEOUS

The Anatomy and Pathology of the Subphrenic Spaces. DAVID P. BOYD. *Surg. Clin. N. America*, 1958, June, p. 619.

A STUDY of the subphrenic spaces in the dissecting room, the postmortem room, at laparotomy, and by reference to standard textbooks of anatomy, suggests that the traditional descriptions are cumbersome and confusing. The author has attempted to simplify the anatomical description of the subphrenic spaces and to correlate it with his experience in dealing with infection in these areas.

The crux of the confusion lies in the fact that the coronary ligaments suspend the liver not from above but from the dorsum, dividing the area into four spaces, namely, left and right subphrenic spaces and left and right subhepatic spaces. Interest in this subject arose from a review of approximately 100 cases of subphrenic infection treated in the past few years. The author believes that the subphrenic abscess as we see it today necessitates a transpleural approach on the right side and that only occasionally can an extrapleural route be used. Subphrenic abscesses on the left side, particularly those involving the lesser sac, are seen with increasing frequency. This increase may be the result of higher incidence of pancreatitis and more frequent operations on pancreas and spleen. These abscesses also require a transpleural approach in most cases.

It is the author's feeling that posterior abscesses can be drained only through a transpleural approach. He has utilized this method for 10 years with satisfactory results, and has had no reason to feel that the frequency of complications associated with the procedure is prohibitive. The pleura is sutured down to the diaphragm with interrupted sutures and the abscess drained directly.

—*Harold L. Method, M.D.*

Abdominal Pain of Cerebral Origin in Children. JOHN STOBO PRICHARD. *Canad. M. Ass. J.*, 1958, 78: 665.

NINETEEN CHILDREN with abdominal pain of presumed cerebral origin were studied. It was found that they could be divided into two clinical groups. The first, and much more common, was characterized by attacks lasting an hour or more and often associated with vasomotor disturbances, nausea, vomiting, or headache. Drowsiness was common during the attack. There was a family history of migraine in the majority of children and the electroencephalograms were normal or showed a mild generalized dysrhythmia. It is suggested that these children are examples of abdominal migraine.

The second group is characterized by attacks lasting 5 or 10 minutes and associated in some instances with confusion, vasomotor disturbances, nausea, or vomiting. A family history of migraine is not characteristic and the electroencephalogram shows evidence of discharges in the temporal region. It is felt that these are examples of true abdominal epilepsy.

The treatment of abdominal epilepsy is the same as the treatment of any other kind of epilepsy. It consists essentially of anticonvulsant medication and, in rare instances, cortical excision. In the treatment of abdominal migraine, drug therapy plays but a small part. In the longer attacks cafergot (caffeine and ergotamine) can occasionally inhibit the episode if it is given at the onset. In some instances small continuous doses of phenobarbitone or diphenylhydantoin (dilantin) are of value. In most cases the attacks continue in spite of medication. The most important facet of treatment is reassurance of the child and his parents. It is well known that these attacks are made more frequent by anxiety and tension. A fundamental of treatment is to have the parents understand that the child should lead a normal life and that the episodes, while tiresome, are benign.

From a therapeutic point of view it is a mistake to call the first group "epilepsy" because the anxiety so engendered in the family group tends to make attacks more frequent. —*Benjamin Goldman, M.D.*

Antihypertensive Drugs as a Cause of the Acute Abdomen. WESLEY FURSTE, DARWIN PHELPS, and PHILIP TAYLOR. *J. Am. M. Ass.*, 1958, 166: 2111.

ANTIHYPERTENSIVE DRUGS may produce acute abdominal problems. Inasmuch as one of the authors within a period of a few months had been asked to see for evaluation of a possible acute surgical abdominal condition 4 patients receiving antihypertensive drugs, it seems worth while to emphasize the possibility of abdominal complaints occurring during such treatment.

Four cases are presented to illustrate the severe abdominal distention that developed with the use of large doses of antihypertensive drugs in these severely tensive patients. In all, the abdomen became increasingly distended and vomiting developed in 2. Decompression measures were started immediately in all cases as soon as the distention appeared and the disturbance gradually improved over a period of several days in all cases. The final diagnosis in all was paralytic ileus attending the use of antihypertensive drugs. Fortunately in no case was surgical exploration advised. —*Matthew H. Evoy, M.D.*

Frequency of Disruption of Wounds Following Laparotomies (Ueber die Haeufigkeit der Ruptur von Laparotomiewunden). A. GERHART and H. SCIOR. *Zbl. Chir.*, 1958, 83: 730.

STATISTICS from various clinics concerning the frequency of wound disruptions after laparotomies are not comparable because some authors include herni-

orrhaphies and appendectomies in their material while others omit them. Furthermore, the interpretation of the term "disruption" is not uniform. Some workers apply this term only to a complete evisceration; others use it also to describe a partial separation of the margins of the peritoneum, muscles, and fascia.

Signs and symptoms of a mild collapse or ileus of obscure origin after the fourth postoperative day should arouse suspicion of wound disruption.

In the majority of cases disruption has an insidious, not an abrupt onset and starts with separation of the margins of the peritoneum. In contrast to disruption, dehiscence is caused by accumulation of serum and development of an infection, and progresses from the skin toward the peritoneum.

The authors advocate an immediate surgical repair, namely, sewing the wound in layers and the use of retention sutures.

In a group of 12,486 laparotomies there were 107 cases, or 0.85 ± 0.24 per cent, of wound disruption. Incipient disruption was observed in 8 per cent of the 107 cases, partial subcutaneous disruption in 31 per cent, and complete disruption in 21 per cent.

Although disruption was more frequent following midline incisions, it occurred also after transrectal, pararectal, and oblique incisions.

In 39 per cent of all cases of disruption malignant tumors were present and in 24 per cent inflammatory processes or traumatic injuries were found. In descending order of frequency the following conditions were found: cancer of the urinary bladder, trauma or inflammation of the spleen, perforated appendix, perforated gastric ulcer, ileus, carcinoma of the cardia, and cancer of the large intestines.

Eighty per cent of the patients were more than 40 years of age but 13 were in the first decade of life.

Disruption occurred in 1.1 ± 0.36 per cent of the men who had a laparotomy and in 0.5 ± 0.29 per cent of the women. However, the fact should be kept in mind that the frequency of carcinoma and peritonitis due to perforation was also considerably greater in men than in women.

In 80 per cent of cases disruption was noticed between the fifth and thirteenth postoperative day.

Of 107 patients with disruption of the wound, 58 or 54.2 per cent died. The cause of death in descending order of frequency was peritonitis, pulmonary embolism, and pneumonia.

A relationship between the frequency of disruption and the season of the year or the incidence of thrombotic phenomena could not be established.

—*Joseph K. Narat, M.D.*

GYNECOLOGY

UTERUS

Uterine Malformation; New Observations of Reparative Surgery (Malformation utérine; nouvelle observation d'opération reparatrice). ÉMILE HERVET. *Gyn. obst.*, Paris, 1957, 9: 504.

IS THE SURGICAL CORRECTION of a uterine deformity, alone, going to prove worthwhile in terms of successful pregnancy?

The history of a patient with a septate uterus is presented in detail. Prior to surgical removal of the septum, the patient had 3 pregnancies which terminated at 3, 6.5, and 3.5 months, with one surviving infant. Preoperative and postoperative hysterograms demonstrated that all but the base of the septum was successfully removed by an operative technique originally described by TeLinde. One year after surgery, the patient again conceived. The pregnancy was terminated by cesarean section at 37 weeks. Exploration of the uterus at that time revealed no defect. The infant died after 15 days of life from a "toxic infectious syndrome."

Two subsequent pregnancies terminated at 2 and 3 months. It was thought that this patient presented the picture of a habitual aborter and that reparative surgery was of little value since some factor other than the defect in the anatomy must be involved. It is concluded that plastic surgery for uterine anomalies is of little value when the patient presents a history of multiple abortions. —*George C. Lewis, Jr., M.D.*

A Case of Primary Tuberculosis of the Cervix (Su di un caso di tubercolosi primitiva del collo dell' utero). S. COLETTA. *Arch. ostet. gin.*, 1958, 63: 83.

THE AUTHOR describes the findings in a 37 year old woman suffering from postcoital hemorrhage and primary sterility. Cervical examination revealed an irregular erosion and cervical biopsy showed this to be a tuberculous lesion. The rest of the genital tract was not involved in the tuberculous process.

The author lay stress on the rarity of the cervix as the primary site of tuberculosis and on the importance of sexual intercourse in the pathogenesis of this condition. Exfoliative cytology may present a misleading picture, and an erroneous diagnosis of primary carcinoma may be entertained. Only histologic examination with bacteriologic confirmation will substantiate the diagnosis. —*A. Wiener, M.D.*

The Origin of Squamous Cell Carcinoma of the Cervix (Zur Genese des Plattenepithelkarzinoms an der Portio). K. MICHALZIK. *Geburtsh. & Frauenh.*, 1958, 18: 479.

WITH the simultaneous use of Papanicolaou-stained smears and Giemsa-stained dried preparations, the author states that cell and nuclear atypia is often found in the presence of trichomonads. His experience rests upon the findings on colposcopy in 5,000 women, 4,000 of whom also had vaginal smears. In approximately one-third of the women with trichomonads cell atypia, Papanicolaou Class 2, was demonstrated. The number of women with trichomonads whose smears were classified higher than Class 2 was as follows:

	Total number	*Those with trichomonads*
Class 3	58	37
Class 4	27	11
Class 5	5	3

Of the 5,000 women, 38 were diagnosed as having carcinoma in situ. Giemsa-staining had been performed in 36 cases, 26 of which demonstrated trichomonads. It is probable that the histologic changes discovered were related to the inflammation produced by the Trichomonas organism.

Cytologically, trichomonal inflammations were characterized by, among other changes, pseudoacidophilia. Colposcopically, in addition to the red and white stippling frequently described, leucoplakic changes were often seen. These may represent an attempt on the part of the epithelium to increase its resistance to the inflammatory process. Histologically, chronic cases of trichomonal infection were frequently characterized by cornification and keratinization. Leucoplakic change is often seen in early squamous cell carcinomas of the cervix. These facts seem to relate cervical inflammation from trichomonads and the origin of cervical squamous cell carcinoma.

—*Warren R. Lang, M.D.*

Carcinoma in Situ of the Cervix (Il cancro "in situ" della cervice uterina). G. BARBIERI. *Lav. Ist. Anat. Univ. Perugia*, 1957, 17: 259.

A TOTAL of 2,852 biopsies of the cervix that were reported as negative for malignant disease were re-examined. These biopsies were taken from 1941 to 1957. In this review, 26 lesions were carcinomatous.

The 26 patients ranged from 30 to 50 years in age. Fifteen biopsies were taken from the portio vaginalis, 2 lesions were in the lining of the cervical canal, and 5 lesions involved the glandular epithelium. Histologically, the tumors of the portio vaginalis were differentiated, scarcely differentiated, and undifferentiated. Those lying within the cervix were all undifferentiated. —*Roland A. Manfredi, M.D.*

Radiogold in the Treatment of Cancer of the Cervix. WILLARD M. ALLEN, ALFRED I. SHERMAN, and H. MARVIN CAMEL. *Radiology*, 1958, 70: 523.

THE MAIN OBJECTIVE in the use of radioactive colloidal gold for the treatment of cancer of the cervix is safe, adequate, and convenient irradiation of the pelvic lymph nodes. The treatment of the primary lesion is no problem. Supplemental therapy is necessary, however, because some patients undoubtedly have cancer in the pelvic lymph nodes which would not be destroyed by direct irradiation of the cervix or by hysterectomy. Radiogold is only an agent for providing supplemental therapy. The properties of radiogold

are nearly ideal for this purpose. The short half-life of 2.8 days limits the duration of irradiation. The radioactivity is primarily beta, so that the majority of the effect is restricted to the immediate vicinity of the interstitial injection. Radiogold, however, is especially valuable because of the manner in which the tissues absorb and "fix" the gold. The small colloidal particles are picked up by the lymphatics and filtered out by the pelvic lymph nodes in much the same manner as the cancer cells are disseminated from the primary lesion.

The authors' first clinical studies with radiogold were made in patients with stage 1 cancer of the cervix, in whom they thought the chance for cure would be as good from the Wertheim operation as by conventional x-ray and radium therapy. It was found that a dose of 50 millicuries in each parametrium did not produce undue injury and that the lymph nodes received intense irradiation. This finding, together with the histologic evidence of irradiation and the presence of "dead"-appearing cancer cells in some lymph nodes, convinced them that radiogold could be used successfully for the supplemental treatment of the pelvic lymph nodes and the parametria.

During the first 2 years they were limited to the study of stage 1 cases, but as they gained confidence in the method, they extended the treatment to stage 2 and then to stage 3. The treatment of stage 1 and stage 2 cases is now fairly well standardized. The primary lesion is first treated in the usual manner, with radium, the total dose ranging between 4,000 and 5,500 mgm./hr. About 2 weeks after the radium application, 50 to 70 millicuries of radiogold are injected into each parametrium. About 2 weeks after the injection of the gold the decision is made as to whether or not a Wertheim hysterectomy and pelvic lymphadenectomy should be done. If the patient is a good surgical risk, they usually operate about 4 weeks after the injection of gold. If, for any reason, the patient is not to have a Wertheim procedure, the total amount of radiation which she has already received is reviewed to determine whether a second radium application is desirable. Usually a second radium application is necessary and is done about 2 weeks following the injection of the gold, the dose being almost always less than that from the first radium implant. The treatment of stage 3 lesions is essentially the same, except that the Wertheim operation is not done and the total amount of irradiation is pushed to the maximum.

This method of treatment gives much more irradiation of the parametria and pelvic lymph nodes than can be accomplished by conventional methods. The problem, then, is to survey the cure-rate and the complications of the treatment with radiogold and radium and compare the findings with the results from x-ray and radium.

The complications directly related to the treatment have been infrequent, and those that have occurred were sustained for the most part in the earlier years of the study. During the first 7 years, 291 patients were treated with radiogold. In this series there were 3 ureterovaginal fistulas, 2 vesicovaginal fistulas, and 7 cases of ureteral obstruction of sufficient degree to warrant treatment. The fistulas occurred exclusively in the patients subjected to the Wertheim operation. The incidence is not high, as there were only 5 fistulas in 121 operations. The serious rectal complications were minimal—only 3 cases. There is, however, another annoying complication. Most patients treated with radiogold have neuritic pain which arises from irradiation of the obturator nerves and the nerves forming the sacral plexus. This pain usually disappears after 2 or 3 weeks.

Careful study of the lymph nodes in the Wertheim cases has provided the authors considerable valuable information. The incidence of positive lymph nodes was 10.4 per cent in stage 1, 29 per cent in stage 2, and 100 per cent (2 cases) in stage 3. The presence of positive nodes provides, of course, definite evidence that treatment with radiogold does not destroy all visible evidence of cancer. The lymphadenectomy carried out in these patients has been fairly complete, so that the incidence does give some indication of what the salvage should be in cases not subjected to operation. It is perhaps more than a coincidence that in the patients treated with only radium and gold the 3 to 7 year corrected salvage is 89.5 per cent in stage 1 and 69.2 per cent in stage 2. This result lends strong support to the idea that failure to sterilize the pelvic lymph nodes results in loss of the patient from cancer. The 3 to 7 year corrected salvage of the patients who were operated upon is 92.1 per cent in stage 1 and 84.2 per cent in stage 2. This is suggestive evidence that the removal of the pelvic lymph nodes, when they contain tumor, does enhance the survival rate in stage 2 cases but probably not in stage 1 cases. Furthermore, the survival rate in the 23 cases with positive nodes at operation is 74 per cent. These data suggest, therefore, that more patients with stage 2 and stage 3 lesions should be subjected to pelvic lymphadenectomy and the Wertheim operation after irradiation, with the hope that salvage can be even further increased.

The over-all 3 to 7 year salvage rate in 175 patients treated with radiogold is appreciably better than the 5 year salvage rate in patients treated with x-ray and radium, especially those with stage 2 and stage 3 lesions. The salvage rate in the gold series is 85.3 per cent in stage 1 (88 cases), 69.4 per cent in stage 2 (62 cases), and 52 per cent in stage 3 (25 cases). The comparable 5 year salvage rates in the patients treated with x-ray and radium in the preceding 7 year period are 80 per cent in stage 1 (130 cases), 46 per cent in stage 2 (174 cases), and 21 per cent in stage 3 (87 cases).

The use of radiogold has several advantages over external deep therapy. First of all, the cost is no greater; second, the reaction in the patient is minimal. There is little or no nausea and no diarrhea from the treatment. Third, any good resident in gynecology can be taught the injection technique in a few months.

Finally, the authors believe their experience with radiogold gives them the right to make a few speculations. They feel that they have reached the maximum tolerable dose with 50 to 70 millicuries in each parametrium. This dose provides about 2,000 gamma roentgens to the midparametrium. When this value is increased by 3,000 gamma roentgens from the radium applications, the gamma dose is still probably less than enough to sterilize the pelvic lymph nodes. They base

this on their figures, which indicate that the dose required to sterilize the cervix is 8,000 to 10,000 roentgens. The effectiveness of the gold, then, is probably due to the intense beta irradiation within the lymph nodes.

The ideal, of course, will be reached when there are ways and means of removing the uterus in patients with carcinoma in situ, just before the lesion becomes invasive. —*Byford F. Heskett, M.D.*

Carcinoma of the Cervix; the Place of Pelvic Exenteration. J. CAMERON LOXTON. *Med. J. Australia*, 1958, 1: 359.

THE FAILURE of conventional treatment—namely, radical surgery of the Wertheim type and radiotherapy—to deal effectively with advanced (League of Nations stages 3 and 4) or recurrent cancer of the cervix, draws attention to the necessity of employing other methods if a worth-while salvage is to be achieved in these late cases.

The types of cancer therapy available are radical surgery, radiotherapy, hormone therapy, and chemotherapy. Chemotherapy of cancer, at present in its infancy, may yet provide an answer. Hormone therapy appears to have little application in cervical cancer. Radiotherapy, popular during the past 35 years because of its expectation of cure without the ordeal or risks of operation, has failed to achieve satisfactory results in advanced cases (less than 5 per cent of 5 year survivals). Unfortunately, little is to be expected from its further development. The use of radioisotopes has a limited value as an adjunct to surgery. Supervoltage therapy, apart from its sparing effects upon the skin, has added little or nothing.

Limited extension of the Wertheim operation to include partial resection of the bladder and other organs is of little value, and is nearly always followed by recurrence. To be worth while the surgical attack in advanced cases must be maximal, and usually involves removal of the bladder or rectum or both, as well as the pelvic lymph nodes, peritoneum, and structures in the pelvic floor. Recent advances in surgical technique and supportive therapy have brought operations of this magnitude within the bounds of practicability.

The indication for pelvic exenteration is that the growth shall have extended beyond the limits of the genital tract and the endopelvic connective tissue immediately surrounding it to involve the bladder and ureters, or rectum, or both. According to Brunschwig of New York, little importance is attached to the patient's age or general condition. Deficiencies in the latter can usually be rectified preoperatively. The only proviso is that the disease is still confined to the pelvis. Autopsy findings in subjects dead of carcinoma of the cervix show that about 75 per cent die while the disease is still confined to the pelvis.

Brunschwig and Parsons both state that the patients most suitable for this operation are those in whom the growth is centrally placed or has extended in an anteroposterior direction rather than laterally to the walls of the pelvis, and in the case of the latter the growth should be focal rather than nodal.

When the first exenteration operations were carried out it was not expected that anything more than palliation for a limited period could be attained. That effective palliation, prolonged survival, and 5 year cure occur in a fair proportion of cases is a matter of record. A great majority of patients have been returned to a normal, productive, and happy existence. The management of their "ostomies" and bags has been carried out with a minimum of inconvenience. The contents of the bag, which are always fluid, are emptied into the lavatory every 4 or 5 hours by removing a rubber ring from the lower end of the bag. The bags are changed every 2 days or so by the patient herself; the procedure is simple and takes only one or two minutes. With the use of a rubberized, nonirritating solution there is no irritation of the skin, no leak, no smell, and the bag is inconspicuous beneath the ordinary clothing.

The value of this work is well established. The results are already better than those anticipated. With careful selection they could be still better. It is exacting work. A high degree of surgical skill is called for. There are many tests of the surgeon's courage, many disappointments. But, as in all things difficult, the sense of achievement is great.

—*Byford F. Heskett, M.D.*

The Surgical Treatment of Cancer of the Cervix Uteri. ALEXANDER BRUNSCHWIG and WILLIAM DANIEL. *Am. J. Obst.*, 1958, 75: 875.

THE AUTHORS state that since no such report appeared to have been published, they attempted to secure an impression of what modern surgery alone could do for carcinoma of the cervix. Carcinoma in situ was excluded.

The material includes all patients seen on the private and ward services of the Gynecologic Service of the Memorial Center for Cancer and Allied Diseases of New York from September, 1947 to May, 1952, and operated upon by attending and resident physicians under supervision.

The results of radiation therapy alone are well known and vary from center to center. The mass statistics collated in 1954 in the tenth volume of the *Annual Report on the Results of Treatment in Carcinoma of the Uterus* and published in 1955 disclose that about 40 per cent of 34,567 patients treated during the last 5 years survived for 5 years; only 7 per cent were in stage 4.

A combination of surgical attack and radiation therapy is advised by some but this only adds to the confusion when comparing statistics. The authors believe that a report of this kind is most important now in order to evaluate the methods of treatment.

They found some practical difficulty in securing a purely surgical series. In their series 461 patients were seen who had had no previous treatment. There were 348 patients representing stages 1, 2, 3, and 4, on whom operations were performed with the hope of cure. In 8 patients only palliative procedures were possible. Six patients had exploratory procedures only because the disease was too advanced, having spread to the upper abdomen. In 54 patients radiation therapy was instituted as primary treatment. Thirty-six patients refused any form of treatment. No treatment was offered 5 patients because of very advanced cancer. Four patients registered for consultation only.

The over-all 5 year survival was 204 patients out of a total of 461 or 44.2 per cent, but this figure means very little because of uncontrolled factors such as variation in stages and methods of treatment beyond the control of the operator.

Of the 348 patients who were subjected to operation there were 97 who received some form of radiation treatment preoperatively (within 6 months but in most instances within a few weeks). These patients must be included in the series regardless of the reason for radiation even though this was not part of the planned program. The reason for the radiation treatment was given in 54 patients. They were not all advanced cases. One table reflects the results of radiation therapy alone.

Nine types of operation were done varying from excision of the cervical stump, hysterectomy, the Wertheim operation, and total exenteration, and the 5 year rates varied from 0 to 80 per cent. Results according to stage varied from 79 per cent 5 year survival in stage 1 to 19 per cent in stage 4. There were 4 deaths (1.15 per cent) within one month from operation, 3 following exenteration procedures and 1 following another procedure.

An advantage of surgical treatment is that a specimen is obtained which affords information as to lymph node metastases. Even when these have occurred the situation is far from hopeless. Among 249 cases apparently free from metastases in stages 1, 2, 3, and 4 the 5 year salvage was 161 or 66 per cent. In 99 cases in which such metastases were detected, the salvage was 26 per cent. Eighteen patients with stage 1 lesions were found to have pelvic node metastases, 11 of whom survived 5 years with no evidence of cancer.

In this series those with preoperative radiation did not do as well as those who had surgery alone. The authors believe that modern surgery is an effective method of treating cancer of the cervix and state that under favorable circumstances and with skilled operators, if the disease is limited to the cervix, patients can be offered an 80 per cent chance for cure. The overall 5 year salvage among 348 patients in stages 1, 2, 3, and 4 was 55 per cent and even with pelvic node metastases present, appropriate modern surgical attack can offer an appreciable chance for cure (26 per cent in 99 patients in the series).

They state that no categorical statement can be made as to whether radiation or modern surgery is over-all the better primary treatment as it depends on facilities, talent, and interest.

They believe that it is important that a "base line" be established to show what modern surgery alone can accomplish. —*Byford F. Heskett, M.D.*

Vaginal Hysterectomy. W. Hawksworth and J. P. Roux. *J. Obst. Gyn. Brit. Empire*, 1958, 65: 214.

One thousand consecutive vaginal hysterectomies which were performed in the Oxford area hospitals from 1943 to 1956 are reviewed. The operative technique is described in detail and there is an excellent discussion of the indications for vaginal hysterectomy and the etiology of prolapse.

There was but one death and only 16 patients required blood transfusions after operation. Morbidity, measured by a temperature elevation to 100 degrees F. on 2 consecutive days in the postoperative period, was present in 32.3 per cent of the cases; the most common cause (158 cases) was urinary infection. The only serious complication was enterocele, which occurred in 8.5 per cent of patients who were examined more than 1 year after the hysterectomy. As a result of the latter figure, the operative technique was changed to include a high posterior fascial repair and enterocele was not encountered in the last 100 cases.

The principal indications for vaginal hysterectomy were menstrual irregularities, symptoms of prolapse, and urinary symptoms which occurred alone or in combination in women of the menopausal and postmenopausal age groups. Vaginal plastic repairs were performed in almost all cases.

Prolapse includes urethrocele, cystocele, enterocele, rectocele, and prolapsus uteri. It is considered by the authors to be the result of herniation of a pelvic viscus thru a defect in vaginal fascia. The operation performed is designed to reconstitute the perivaginal fascia and to this end the cervix uteri is considered unnecessary. Hence vaginal hysterectomy and plastic repair is considered preferable to the Manchester operation in women past 40 years of age.

—*M. Leon Tancer, M.D.*

Some Particular Technical Points of Total Hysterectomy (Quelques points particuliers de la technique de l'hystérectomie totale). R. Contamin and Y. Gueguen. *Rev. fr. gyn. obst.*, 1958, 53: 301.

In spite of the many advantages which total hysterectomy represents it is still not performed as often as it should be. Subtotal hysterectomy is much inferior to total hysterectomy since the remaining cervix often harbors a persistent infection and in 2 to 4 per cent of the subtotal hysterectomies, according to statistics, cancer develops in the cervical stump.

Total hysterectomy is not used more frequently because of:

1. the difficulty of correct hemostasis and, therefore, a greater risk of injury to ureters and the urinary bladder, particularly in technically difficult cases.
2. postoperative genital descensus.

To avoid these complications the authors stress the necessity of a systematic ligation of all blood vessels as close to the uterus as possible, in this way obviating the risk of an injury to the urinary bladder and ureters.

The re-establishment of suspension of the vagina by attaching it with a few sutures to the round and uterosacral ligaments prevents the genital descensus which often complicates total hysterectomy.

—*M. Srokowski, M.D.*

ADNEXAL AND PERIUTERINE CONDITIONS

Fibroma of the Fallopian Tubes (Contributo allo studio del fibroma tubarico). O. Costantini. *Clin. ostet. gin.*, 1958, 60: 33.

The patient was a 30 year old married woman with 2 healthy children; she had undergone one abortion. For about a year the patient had been suffering attacks of pain in the right iliac fossa, and irregular episodes of subfebrile temperature.

At examination the uterus was found to be larger than normal and markedly retroflexed; the right tube and ovary were enlarged, painful, and prolapsed into the sac of Douglas; the adnexa on the left side were palpable. The diagnosis was uterine retroversion and bilateral sclerocystic ovaritis, predominantly on the right side.

At operation the diagnosis was verified and in addition, a smooth, firm tumor, the size of a hazel nut and rotated through 180 degrees, was found in the right tube.

Histologic examination disclosed a parenchyma of irregular muscle cells with little stroma and a vascular rete. Hemorrhagic infarcts present were probably the result of torsion of the pedicle of the tumor.

This neoplasm is of particular interest, both because of its rarity and because it represents a case of pure leiomyoma. —*John W. Brennan, M.D.*

EXTERNAL GENITALIA

Epidermoid Carcinoma of the Vulva; An Analysis of 238 Cases. THOMAS H. GREEN, JR., HOWARD ULFELDER, and JOE V. MEIGS. *Am. J. Obst.*, 1958, 75: 834, 848.

EPIDERMOID CARCINOMA of the vulva, when promptly recognized and treated by adequate surgery, is far more curable than was formerly recognized.

Proper management includes an appreciation of the following points:

1. Carcinoma of the vulva is a unique localized lesion, not related to other skin cancers either in behavior or response to treatment.

2. The primary lesion is diffuse, tending to be multicentric in origin and, therefore, capable of involving the entire vulva.

3. There is a marked tendency to lymphatic spread, which is often leisurely, frequently bilateral, and usually progresses stepwise from the femoral and inguinal nodes to the external iliac, hypogastric, and obturator nodes. Distal metastases are uncommon unless treatment has been delayed.

4. Leucoplakia is an important local precursor. The possibility of carcinomatous change in vulvar leucoplakia is so great as to demand careful observation, if not to justify prophylactic vulvectomy.

5. In spite of the fact that these patients are elderly and frequently have associated obesity, diabetes, and cardiovascular disease, extensive surgery is tolerated extremely well.

6. Adequate surgery is more important to the prognosis than the size, type, or location of the lesion, or the previous treatment. Preoperative estimations of nodal involvement are highly inaccurate.

7. There is a marked tendency to delay on the part of both patient and physician. Statistics do not indicate any recent improvement in these respects.

The authors have reviewed 238 cases of primary invasive epidermoid carcinoma of the vulva. Excluded from the series are all instances of carcinoma of the urethra, vagina, or Bartholin's gland. Also excluded are all cases of carcinoma-in-situ, Paget's disease, basal cell carcinoma, and malignant melenoma. All treatment was given in one of two hospitals using essentially the same methods and same medical staff.

In this group, 69 were given adequate treatment, which is defined as a radical vulvectomy plus a radical bilateral groin dissection (femoral, inguinal, external iliac, hypogastric, and obturator nodes). Since 1949, the operation has been done as a one-stage procedure which includes a block dissection of the entire area and, usually, primary closure of the skin edges. A detailed description of the operation can be found in *An Atlas of Pelvic Operations* by Parsons and Ulfelder.

The 5 year salvage for patients treated in the years from 1927 to 1950 was as follows: no treatment or palliative treatment 0 per cent, inadequate surgery 24 per cent, adequate surgery 61 per cent. The primary operative mortality for adequate surgery was 5 per cent (0 per cent for the more recent one-stage procedure). The principle postoperative complications were minor wound sepsis and necrosis (45 per cent) and phlebitis (7 per cent). Long term sequelae included leg edema (26 per cent), pelvic relaxations (12 per cent), stress incontinence (7 per cent), and hernia (5 per cent).

Deaths from distal metastases were uncommon, usually occurring late in the course of the disease in patients whose symptoms were of long duration prior to therapy. Groin recurrences were rare, attesting to the efficacy of lymph node dissection. Those patients with large primary lesions extending beyond the confines of the vulva had the poorest prognosis; a seemingly adequate radical vulvectomy rarely proved curative. It was felt that large posterior lesions would be benefited by an additional posterior pelvic exenteration, a procedure well tolerated even by elderly women. In contrast, large anterior lesions would not be benefited by an anterior or total exenteration because of the high operative mortality.

Vaginal smears are of limited value in the detection of early vulvar carcinoma because a large percentage are reported to be negative. However, vaginal smears are sometimes helpful in detecting local recurrences. From the study of a few patients, it seems possible that there is a correlation between the so-called sensitization response or S.R. of the vaginal smear and the presence of extensive lymphatic spread.

As the authors point out, it should be remembered that "these patients are noteworthy for their longevity in spite of their infirmities."

—*Lester T. Hibbard, M.D.*

MISCELLANEOUS

The Use of Celioscopy and Pneumogynecography in the Diagnosis of Gynecologic Disease (L'associazione celioscopia e pneumoginecografia nella diagnostica ginecologica). C. DURANDO and M. FACCINI. *Minerva gin.*, Tor., 1958, 10: 187.

THE AUTHORS have used the techniques of pneumoperitoneogynecography and celioscopy in 212 patients with predominantly inflammatory gynecologic affections. Because of the often inadequate and inappropriate use of antibiotics in the treatment of specific and nonspecific pelvic inflammatory disease, the diagnosis of this condition by conventional diagnostic procedures often proves impossible. By the use of the aforementioned techniques, a direct visualization of the pathologic process is obtained and the functional status of the female pelvic organs may be examined.

To obtain optimum results both procedures should be employed since they often prove complementary. Endoscopy is especially valuable in visualizing the gross pathologic changes in the affected organs, as the color, texture, and gross anatomic disturbances can be appreciated. Gynecography is preferable, however, in the study of genital tuberculosis since the functional state of the tubes can be better assessed with this method. If cases are carefully selected and vigorous aseptic techniques employed, both these procedures can be undertaken without hazard to the patient. —*Alfred Wiener, M.D.*

Chorioepitheliomas (Les chorio-épithéliomes). J. A. SCHOCKAERT. *Sem. hôp. Paris, Ann. chir.*, 1958, 12: 131.

THE AUTHOR collected 516 cases of chorioepithelioma from the literature, of which 23 were personal ones, and made a detailed analysis from several standpoints. One-third of the cases followed term pregnancy, another third, abortion, and the last third followed mole. Because of the rarity of mole, a higher percentage of chorioepitheliomas follows molar than nonmolar pregnancies. Although its frequency varies in different areas, perhaps being highest in the Philippines, nevertheless it can be classified as a condition which is truly rare. With respect to its clinical aspects, it is emphasized that the tumor develops only after separation of the main mass of the trophoblast, and there is frequent disappearance of the primary tumor despite metastases. Occasionally, metastases may remain dormant for several years, as evidenced especially by their delayed appearance years after hysterectomy for the original lesion.

The confused terminology of this subject is reviewed. The terms employed by the author in preference to others are (1) (hydatid) mole, (2) chorioadenoma (destruens), and (3) choriocarcinoma. The pathologic features are also reviewed, and mention is made of the lack of uniformity in their interpretation.

Gonadotropin levels are far from constant, and, in fact, cases are cited in which the Aschheim-Zondek test was negative despite very advanced disease. In diagnosis the importance of abnormal bleeding and proper evaluation of curettings are stressed. The frequency of choriocarcinoma is given as one case in 160,000 normal pregnancies. Following hydatid mole, 1 of 4 to 6 pregnancies are said to develop into chorioadenomas, and 1 of 40 to 100 into choriocarcinomas. Since the possibility of malignancy is especially high after hydatid mole, it is these cases which demand the most careful study. The tissue must be carefully examined by one who is especially qualified in this field. The gonadotropins must be assayed every 15 days. With recurrence of the clinical symptoms or persistent chorionic gonadotropins, hysterectomy will be desirable in some cases in which the factors of age, desire for children, and the like, are not of primary concern. In other cases repeat curettage will be indicated.

In the treatment of mole, curettage must be done; in the cases shown to be chorioadenomas, complete hysterectomy is necessary regardless of metastases, and in choriocarcinomas, hysterectomy with excision of metastatic lesions should be done if feasible. Other types of treatment, e.g., with x-rays, hormones, and transfusions of blood from pregnant women, each have their enthusiasts, but they are probably not of great help.

The work of Deruyck, in which a new ultrafilterable virus was isolated from the vesicular fluid of molar tissue, is cited. This appears to offer promise, and one is attracted to the possibility of controlling the disease immunologically through the therapeutic production of antibodies.

The older work of Fraenkl is cited, in which the serum of pregnant women was found to contain a substance capable of inhibiting or limiting the advancement of the trophoblast; this substance was found to be absent in 3 cases of choriocarcinoma. The author envisions a normal balance between this substance and the maternal tissues. When this balance is disrupted in either direction one may find, on the one hand, uninhibited trophoblastic development or, on the other, trophoblastic degeneration, diminution of hormonal activity, and abortion.

—*D. N. Danforth, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Circulation of the Amniotic Fluid as Indicated with Radiopaque Substances (La circolazione del liquido amniotico indagata con sostanze radio-opache). V. DANESINO, E. GENAZZANI, F. CATURANI, and A. GRAZIANI. *Arch. ostet. gin.*, 1957, 62: 365.

ALTHOUGH it is known that the amniotic fluid possesses definite biologic properties, such as an oxytocic action, a fibrinolytic action, and bactericidal action, and that it differs little in composition from that of the maternal interstitial fluid, little is known as to its origin, resorption, and circulation. In 1948, following injection of "tenebryl" and "ombradyl" into the amniotic fluid of pregnant women Portes and Granjon observed rapid opacity in the maternal urinary tract. In 1950–1952, Rosa reported that "ombradyl" injected intravenously in a pregnant woman was not demonstrable in the amniotic fluid. If it was injected into the amniotic cavity, however, the digestive tract of the fetus was visualized and later the maternal digestive tract.

The authors injected lipiodol, "triopac," or "ioduran" in aqueous or oily solution into the amniotic sacs of 12 guinea pigs. Following a ventrodorsal roentgenogram establishing the number and location of the fetuses, 1 to 1.5 or 2 c.c. of the amniotic fluid was withdrawn into an ordinary syringe and an equivalent amount of the radiopaque substance in aqueous or oily solution was reinjected immediately without removing the needle. In 2 cases, 1.5 c.c. of "ioduran" was injected directly into the fetus. Following the first injection, control roentgenograms were taken at regular intervals of 15, 30, 45, and 60 minutes for the first hour, and thereafter every 30 and 60 minutes, for 6, 12, 18, and 24 hrs. Three of the treated animals were subjected to cesarean section 10 hours after the injection, the rest delivering spontaneously after 24 to 36 hours.

All the fetuses were in good condition except those into which the radiopaque substance had been injected directly. No ill effects were observed as a result of the injections except in those animals injected directly with the substance. The information sought included the distribution of the radiopaque substance in the amniotic fluid, possible visualization of the fetal organs and digestive apparatus, and of the maternal organs and apparatus. The oily solutions formed plainly visible agglomerations that were distributed irregularly throughout the amniotic sac, while the aqueous solutions were uniformly distributed. The outlines of the amniotic sac appeared rapidly following injection of both oily and watery suspensions. With the former the visualization was more regional because of the slow distribution of the oily suspension in the amniotic fluid due to the forces of gravity and the fetal movements with collections of contrast medium appearing in various regions. With the aqueous solution, because of better homogenization between the injected fluid and the amniotic fluid, an almost perfect image appeared in the form of thin opaque striae according to the location of the walls of the sac in relation to the direction of the rays.

Visualization of the fetal digestive tract indicated that the tract constitutes one of the principal paths for distribution of the amniotic fluid. The constant demonstration of radiopaque residua in the nasal cavity suggests that the radiopaque fluid enters not only through the mouth but also through the nasopharynx. Visualization of the kidneys indicated that following absorption in the digestive tract and passage into the circulation, at least a portion of the fluid is excreted through the fetal kidney. The appearance of a small portion of the radiopaque substance in a central placental area suggests that some part reaches the placental filter, the most probable hypothesis being that it reaches the placenta via the fetus (digestive tract, blood, or umbilical cord) although the possibility that some of the amniotic fluid might pass directly into the placental tissue cannot be excluded. Visualization of the maternal bladder indicates that some part of the opaque substance is excreted via the maternal renal apparatus. The findings appear to confirm the theory that the amniotic fluid has a special circulation. It is ingested by the fetus, one portion passing through the digestive tract and some being absorbed through the fetal gastrointestinal mucosa and re-excreted through the fetal excretory passages into the amniotic cavity or passing via the placental filter into the maternal circulation. In the author's opinion, this would not exclude the possibility that some amniotic fluid might be absorbed through the amniochorial membrane or via the fetal skin.

—*Edith Schanche Moore.*

The Evaluation of Tests to Differentiate Pre-Eclampsia from Hypertensive Disease. LEON C. CHESLEY and CARLO VALENTI. *Am. J. Obst.*, 1958, 75: 1165.

THIRTY-ONE PREGNANT WOMEN were carefully selected on the basis of a fairly definite clinical diagnosis of either pre-eclampsia or hypertensive disease.

A battery of 5 tests that have been proposed for the differentiation of pre-eclampsia from hypertensive disease was studied in the 31 patients.

It was concluded that the blood pressure responses to the cold pressor test and to the intravenous injection of tetraethylammonium chloride were not significantly different in the two groups of patients. These two tests seemed to have no practical value in the differential diagnosis.

The average responses of women with pre-eclampsia were significantly different from the average responses of pregnant hypertensive women in the three following tests studied.

In pre-eclampsia the mean rise in blood pressure after the subcutaneous injection of vasopressin was greater than in hypertensive women. The responses overlapped from group to group, however.

In pre-eclampsia the mean renal clearance of urate was significantly depressed as compared to the mean

clearance in pregnant hypertensive women. However, the clearances overlapped from group to group.

In pre-eclampsia the mean urinary concentration of sodium, after salt loading, was significantly less than in pregnant hypertensive women. Again, there was considerable overlapping of the responses from group to group.

None of the tests was specific enough to be used for definite diagnosis. Use of the 3 tests in conjunction with each other did not improve the situation, because any one of the tests was equally likely to disagree with the other two (and with the clinical diagnosis).

—Alan Rubin, M.D.

Porphyria Complicated by Pregnancy. DUNCAN R. NEILSON and RONALD P. NEILSON. *West. J. Surg.*, 1958, 66: 133.

SEVERAL HUNDRED CASES of human porphyria have been reported in the literature. However, the association of pregnancy with the condition is quite rare. Nonetheless, a clinical awareness of this disease is important to the obstetrician since each case usually presents peculiar problems in diagnosis; furthermore, each one represents a potential maternal mortality which might be effected in certain cases by the injudicious use of common drugs such as barbiturates and sulfonamides.

Three cases are reported. The first and second patients were in the first trimester of pregnancy. Bizarre symptoms, neurologic, febrile, and hepatic, were present. The port-wine-colored urine and the chemical discernment of porphyrin pigments in the urine were diagnostic. Both patients died.

Patient number three was 3 weeks postpartum. Chills, fever, and left lower quadrant pain led to a urologic study. She did not respond to therapy. Further urine studies showed it to be orange in color and containing porphyrin bodies. All barbiturates were stopped. Rapid recovery developed.

—John R. Wolff, M.D.

Effect of Cortisone and Its Derivatives on the Edema of Pregnancy (Azione del cortisone e derivati su gli edemi in gravidanza). G. REBAUDI and F. FERRARIS. *Minerva gin.*, 1958, 10: 113.

FOLLOWING a review of the numerous factors influencing water metabolism in man including the metabolism of the electrolytes, the mechanism of renal regulation, the role of the sex steroids and the adrenal cortical hormones, the authors proceed to discuss the humoral changes taking place in pregnancy. These changes include a physiologic hydrosaline retention which may become excessive or altered in the toxemia of pregnancy. Even in a normal pregnancy, urinary elimination may be diminished or retarded, and in cases of toxemia of pregnancy this condition becomes more marked. Retention of fluid may be extracellular or intracellular. In toxemia of pregnancy, the extracellular retention of fluid is even greater than in normal pregnancy. The total water content is also abnormally great in pre-eclamptic states. There is also salt retention in pregnancy. The various factors responsible for water and salt retention in pregnancy are enumerated, including venous hypertension, hypoproteinemia, glomerular changes, and hormone disturbances. It is especially the latter that bear the main responsibility for the edema of pregnancy. However, the chief methods for combating edema have been treatment for sodium retention, prevention and correction of metabolic disorders, and procedures designed to increase the elimination of water.

The present investigation concerns the effect of cortisone and its derivatives on the edema of pregnancy. Ten pregnant women with moderate or severe edema were given 25 mgm. of prednisone daily by mouth. Urine was collected and measured for the next 24 hours, and 10 c.c. of blood were withdrawn before and after administration of the hormone, to ascertain the changes in chloride, sodium, and potassium content. The patients treated with a single dose of prednisone daily responded with disappearance or marked diminution of edema, with only one exception. An increase in the 24 hour diuresis was also noted. No marked changes were observed in the chloride, potassium and sodium content of the serum; in most of the women there was a slight increase in the amount of chloride and potassium and a reduction in potassium. In one case of normal pregnancy there was a slight increase of sodium and potassium, with a slight decrease in chloride, and in one case with moderate edema, there was a slight increase in all three. Thus in spite of the increased 24 hour diuresis, and the reduction or disappearance of edema, the serum concentrations of chloride, sodium, and potassium remained practically within normal limits. The fact that the electrolyte balance was maintained is explained as being possibly due to the "stress" effect of the prednisone on the adrenal function of the mother and fetus and on the placental corticoid activity.

—Edith Schanche Moore.

Localization of the Placenta in Suspected Cases of Placenta Previa with the Use of Radioactive Isotopes (RIHSA). NESTOR R. CANOY. *J. Philippine M. Ass.*, 1958, 34: 302.

THE AVERAGE PLACENTA measures about 20 cm. in diameter and is 2 to 3 cm. thick. On x-ray films it appears as part of a crescent-shaped zone, about 7 cm. thick, which also comprises 1 to 2 cm. of thickness of the uterine wall at that point and a saucer-shaped area of amniotic fluid which has a comparable radiological density. The basic principle in soft tissue technique to localize the placenta is the assumption that the placenta occupies a seemingly empty semilunar space between the uterine outline and the volume occupied by the fetus, since the placenta is likely to displace fetal parts from the physiological central position. It is important, in this connection, to realize that the junction of the upper and lower segments of the uterus during the last trimester of pregnancy can be represented on a line drawn from the lower symphysial border to the first sacral segment on lateral films. Before the onset of labor the internal os will be located 7 to 11 cm. below that line in the vicinity of the ischial spines.

The authors use "gravitational placentography" with cystograms for conventional soft tissue technique. The main principle of this modification is that estimates of increased distances between uterine outline or bone and the fetus (usually over 2 cm.) are only

valid if the fetus is forced into close approximation to the structure under investigation by positioning into a suitable gravitational relationship. In this way, errors such as dead spaces filled with amniotic fluid when the fetus falls away in the recumbent position, blood pools due to partial separation of the placenta, and displacement by distended bladder or rectum can be avoided. An accuracy of 90 to 95 per cent can be expected in the usual case, but only 75 per cent in a marginal placenta previa. The best results are obtained when a negative diagnosis can be made.

Since these techniques are not totally satisfactory, it has been attempted to use the much more exact method of amniography with contrast media, but this method has proved to be too dangerous for mother and infant. The third way to localize the placenta is with angiography which is based on the fact that the vast vascular bed of the placenta will concentrate contrast media enough to visualize a placental outline. However, this requires either the dangerous translumbar approach to the aorta or the minor surgical procedure of exposure of the femoral artery and its catheterization.

The author has devised a comparatively simple method whereby radioiodinated human serum albumen (RIHSA) is injected intravenously and quickly mixes with the circulating plasma. If a scintillation detector, involving fluorescence and a photomultiplication tube is used rather than a Geiger counter the injected dosage can be held down to 10 microcuries and still gives a satisfactory outline of the placenta by its gamma ray emission. This technique combined with conventional soft tissue technique was used in 36 patients. Twenty-three of the patients had normal pregnancies, and 4 had abnormal tissue shadows on conventional films, but a placenta previa could be ruled out with the isotopic method. The remaining 9 cases consisted of 5 instances of placenta previa and 4 of marginal implantation, all of which were conclusively demonstrated preoperatively and confirmed by surgery. The question of fetal damage by radioactive iodine is only mentioned in passing.

—W. D. Bergman, M.D.

Antihistaminics in the Management of Abortion. Abdel Hamid Badawy and Beatrice Gabrawy. *J. Obst. Gyn. Brit. Empire*, 1958, 65: 260.

The plasma histamine and the histaminolytic indices have been determined in 50 cases of threatened abortion. Among the patients 15 were habitual aborters. In all 50 patients the plasma histamine was raised and the histaminolytic index was lowered. Pyribenzamine lowered the level of plasma histamine in all of them. The fetal salvage rate has been raised in cases of habitual abortion as compared to control cases.

—John R. Wolff, M.D.

The Treatment of Threatened and Recurrent Abortion; A Critical Review. Joseph W. Goldzieher and Benedict B. Benigno. *Am. J. Obst.*, 1958, 75: 1202.

The literature on threatened and recurrent abortion is reviewed. The abortion frequencies predicted by the Malpas formula do not conform to the observed facts; hence the substitution of this prediction for a control group of patients vitiates the subsequent conclusions. Restricting the term "recurrent" or "habitual" abortion to three rather than two consecutive abortions has no statistical justification. It is only after four consecutive abortions that the subsequent abortion rate changes appreciably. The prognosis in "recurrent abortion" is markedly influenced by the past obstetrical history ("primary" or "secondary" abortion) and by the urinary pregnandiol excretion. For investigative purposes patients should be classified at least with respect to these two criteria. In the treatment of recurrent abortion, psychotherapeutic influences appear to be just as successful as the most complex medical regimes. The abortion rate in patients who receive stilbestrol is not significantly lower than the rate in patients who receive no hormones at all. Recent evidence indicates that massive progesterone therapy may be of value in patients with recurrent abortion who have low urinary pregnandiol excretion. In "threatened abortion", the prognostic significance of a low pregnandiol excretion is very grave. There is no statistical evidence for the value of stilbestrol therapy. There is definite evidence, as well as some inconclusive reports, of benefit from progesterone therapy. Particularly in the case of patients with low pregnandiol excretion, the benefit of progesterone therapy seems to be statistically valid.

Some problems in the statistical design of experiments in this field are discussed, together with an illustration of the application of the chi-square method for determining the feasibility of proposed clinical investigations.

—Alan Rubin, M.D.

LABOR AND ITS COMPLICATIONS

Surgical Induction for Suspected Placental Insufficiency. Ian Cope and Morton G. Pearson. *Brit. M. J.*, 1958, 1: 1211.

After observing a sevenfold increase in surgical induction of labor at the Hammersmith Hospital, London, between 1951 (2.1 per cent) and 1956 (14.6 per cent), the authors attempted to determine its safety, effectiveness, and value. More than 70 per cent of the surgical inductions in 1956 were carried out for (1) postmaturity, (2) mild hypertension, or (3) bleeding during pregnancy. The 6 year series totaled 999 cases.

The risk to the mother is approximately that of cesarean section. This concerns morbidity or puerperal pyrexia as determined by the Ministry of Health standard. The cesarean section rate after induction was 14.5 per cent against an over-all morbidity of 5.4 per cent. Cesarean section was performed when labor was not established within 72 hours from the time of surgical induction.

The authors believe the factors in favor of surgical induction are (1) reduction of the stillbirth and neonatal death rate in the induced group to that of the whole group, and (2) lack of increase in the over-all cesarean section rate. Factors against surgical induction were (1) lack of apparent improvement in the stillbirth and neonatal death rate, (2) the 10 to 15 per cent risk of cesarean section after induction, (3) slightly increased morbidity, and (4) psychological trauma. The increased induction rate apparently did not effect a reduction in over-all fetal mortality in the 6 years.

—Stephen W. Carveth, M.D.

The Vacuum Extractor. WILLIAM D. CUNNINGHAM. *Med. J. Australia*, 1958, 1: 595.

A METHOD of operative delivery with the vacuum extractor is reported and described, based on experience with 21 deliveries.

The traction system of the instrument is composed of two metallic cups which fit into each other, the inner cup being perforated, but not the outer one. These two pieces are covered by a rubber cup which, at the edge of the metal cups, forms a pressure-dispersing ring with a width of 0.5 to 1.0 centimeter. In the center of the metal cup there is a small pipe, on which a suction tube is fastened. In this tube a traction chain is running. This traction tube ends in a metal handle with two connectors, one for the suction cup tube and one for the pump tube. The apparatus is completed by a glass bottle fitted with a vacuum meter and two metal connectors, one for the vacuum extractor and one for the pump tube with a back-valve.

The suction cup of the vacuum extractor is manufactured in four sizes, with openings of 55, 60, 70, and 80 mm. in diameter, respectively. The suction cup is fastened to the leading part of the fetal skull and a vacuum of 0.6 to 0.8 kgm. is applied; traction by the hand may then be commenced.

Conditions necessary for the safe application of this instrument are similar to those for the obstetric forceps and are here given. The cervix must be fully dilated when the vacuum extractor is being used to deliver the child. The vertex must be presenting; the vacuum extractor cannot be applied to the face or to an after-coming head. The head should be in the cavity of the pelvis. The membranes must be ruptured. The mother's bladder and rectum should be empty.

With the patient in the lithotomy position, the usual preliminaries are performed and aseptic and antiseptic precautions are taken.

The advantages of this method of extraction are as follows:

1. General anesthesia is not necessary for the procedure.

2. Very little trauma to the baby occurs, for the extractor is supplementary to the uterine contractions and does not replace them as does the obstetric forceps. There is an insignificant compression of the fetal skull.

3. Excessive or ill-directed traction is impossible, for the cup will slip off the scalp.

4. The vacuum extractor may be used for the promotion of regular strong contractions in primary uterine inertia.

The disadvantages are:

1. The superficial circular abrasion of the baby's scalp is the only trauma that occurs directly from the use of the vacuum extractor; this is an undesirable result.

2. The hand pump becomes inefficient after a time and the pumping is very fatiguing to the assistant. This would be more fatiguing during intermittent traction by the vacuum extractor in cases of primary uterine inertia. It may be overcome by having a suction motor adapted to give controlled suction. The control screw is calibrated to a maximum of 0.8 kgm.

—Harry Fields, M.D.

Twins; Collision, Impaction, Compaction, and Interlocking. EDWARD D. NISSEN. *Obst. Gyn.*, 1958, 11: 514.

THIS EXCELLENT paper will undoubtedly assume the proportions of a classic in an admittedly rare but fascinating field. The projected incidence of entanglement of fetuses has been estimated as only one in 1,000 twin gestations. However, as the author points out, when this problem occurs it can tax the ingenuity of even the most resourceful obstetrician. A very careful review of the world's literature from 1882 to date has been made and 69 cases are succinctly summarized. No maternal loss occurred in the entire series. However, of 138 infants, only 78 survived. The over-all perinatal mortality was 43 per cent. Precise definitions of collision, impaction, compaction, and interlocking are given. The author defines collision as contact of any fetal parts of one twin with those of its co-twin, thereby preventing engagement of either. Impaction is defined as the indentation of any fetal parts of one twin onto the surface of its co-twin, thereby permitting partial engagement of both simultaneously. Compaction is defined as the simultaneous full engagement of the leading fetal poles of both twins, thus filling the true pelvic cavity and thereby preventing further descent or disengagement of either twin. Interlocking is defined as the intimate adhesion of the inferior surface of a twin's chin with that of its co-twin above or below the pelvic inlet.

Two thirds of all the cases presented as breech and then, vertex. The least common presentation was that of double breech. Youthful primigravidas with uterine hypertonicity, premature rupture of the second sac, or oligohydramnios have been indicated as prime suspects in an analysis of possible etiologic factors. The first twin is the more vulnerable of the two. Careful analysis of the many interesting cases by the author suggests that even with the advantages of modern medicine, the fatal course of events might have run almost as high as that which truly occurred. An approach to therapy in the different groups is suggested, but the basic conclusion is offered that extraordinary individualization is required because of the multiple variables. The author does not present the specific recommendation, but the feeling is inescapable that if a diagnosis can be made early (and particularly before the death of one or both twins) cesarean section would offer the best prognosis.

—Thomas W. McElin, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Puerperal Sterilization. CHAMANLAL MEHTA and AJIT MEHTA. *J. obst. gyn. India*, 1958, 8: 199.

THE AUTHORS review 286 cases of tubal sterilization performed on their private service from 1944 to 1956, representing 7.3 per cent of their puerperal patients. Socioeconomic factors comprised the leading indication. The average patient was between 30 and 39 years of age with 5.4 living children. A modified Pomeroy technique was used and spinal anesthesia was preferred. The operations were performed within 48 hours after delivery. Morbidity was 15 per cent.

For later follow-ups questionnaires were sent out to the 286 patients and 116 replies were received. Of these 116 there were no failures. Thirty-seven or 31.9

per cent reported menstrual irregularities; 9 or 7.7 per cent complained of obesity. None complained of sexual difficulties. The over-all results of the series are favorable. —*Donald R. Dye, M.D.*

NEWBORN

Subcutaneous Gangrene in the Newborn; A Report of 12 Cases. WANG HUEI-LING and SUNG HSIU-YING. *Chinese M. J.*, 1958, 76: 485.

SUBCUTANEOUS GANGRENE in the newborn, previously described as cellulitis of the newborn, has only been reported in recent years. The authors report the cases of 12 newborn infants suffering from this disease. The infants varied from 4 to 48 days of age. The onset in 10 of the 12 was during the first 28 days of life. The infants were seriously and acutely ill. The skin lesions were predominant over the lumbosacral area, the buttocks, and the back. Early lesions were red and slightly elevated with an indistinct margin. The skin in the central portion of the lesion tended to be separated from the underlying tissue, became red in color, progressed to purplish black, and then gangrene. On incision in this area the lesion was found to be undermining. There was a small amount of pus which was grayish-yellow in color. Staphylococcus aureus was the most common organism cultured, although bacillus coli and occasionally streptococci and other organisms were noted. The patients were treated with one or more antibiotics, usually penicillin plus aureomycin, and incision and drainage. The authors decided that early incision and drainage would yield better results after their experience with the first few children. The wounds were irrigated daily and the necrotic tissue removed. Local antibiotic therapy apparently had no effect. Following incision and drainage the child improved rapidly; wound healing required at least a month. There was one death in the group; this was in a child in whom incision and drainage was deferred in the hope antibiotic therapy would be effective. The lesion was apparently due to local penetration of bacteria rather than to blood borne bacteria and in most cases was believed to be due to penicillin resistant staphylococci.

—*James F. Donnelly, M.D.*

MISCELLANEOUS

Fertility Control with Oral Medication. GREGORY PINCUS, JOHN ROCK, CELSO-RAMON GARCIA, EDRIS RICE-WRAY, and Others. *Am. J. Obst.*, 1958, 75: 1333.

THE MENSTRUAL CYCLES of 265 married Puerto Rican women were studied. Data from 1,712 menstrual cycles indicate that the ingestion of 10 mgm. of norethynodrel, supplemented by varying amounts of estrogen, on a day 5 through day 24 regime, results in a normal distribution of lengths of menstrual cycles. If this regime is altered by omission of medication, there may ensue either shortened menstrual cycles, caused presumably by withdrawal bleeding, or lengthened menstrual cycles, resulting from adequate maintenance of the endometrium despite intermittent lack of medication or from prolonging of the treatment by use after the twenty-fourth day of the tablets missed earlier.

Presumption of suppression of ovulation is indicated by the fact that conception did not occur in any instance in which the medication schedule of day 5 through day 24 was followed faithfully. Among those who omitted medication for 3 or more days, the low incidence of pregnancy was roughly proportional to the number of unused tablets.

This compound appeared to exert a prompt progestational effect on the endometrium which, after 5 to 7 days of medication, did not progress in terms of glandular response, but did advance with reference to the stromal reaction. Studies of urinary excretion of steroids indicated a decrease in 17-hydroxycorticosteroids and, to a dubious extent, in 17-ketosteroids.

Side effects sufficient to cause interruption of therapy occurred in 18 per cent. The symptoms consisted of breast tenderness, nausea, dizziness, vomiting, and pelvic pains. The administration of a magnesium aluminum glycinate antacid led to the reported disappearance of untoward reactions in 82 per cent of the subjects.

Several difficulties were encountered in maintaining complete fertility control. There were 19 pregnancies, 5 of which were in women who had omitted 3 to 17 tablets from the advised regimen, and 14 in individuals who had stopped medication because of "reactions" or carelessness. The pregnancy rate in these 19 patients was 13 per 100 marriage years, which may be compared with an expected incidence of 67 pregnancies per 100 marriage years from Puerto Rican women of this age range not known to be practicing contraception. The fact that 14 women who had discontinued medication after 1 to 17 cycles became pregnant within 1 to 3 months thereafter suggests that the drug, as thus used, does not interfere with subsequent fertility. —*Alan Rubin, M.D.*

An Analysis of 100 Consecutive Vaginal Deliveries Following Cesarean Section. H. L. RIVA and J. L. BREEN. *Am. J. Obst.*, 1958, 76: 192.

ONE HUNDRED consecutive vaginal deliveries in women who had had previous cesarean section were analyzed. They represented 70.24 per cent of all previous cesarean section cases observed in a 5 to 6 year period.

Of this group 43 per cent had been delivered vaginally one or more times as compared to 57 per cent who had never experienced a vaginal delivery.

Thirty-five per cent had their initial section for cephalopelvic disproportion. The weight of the infants played a role in allowing for successful vaginal delivery. In 77 per cent, the infants that were delivered vaginally weighed less than those delivered by cesarean section. In most cases, pelvimetry studies in this group disclosed an adequate pelvis.

Complications were minimal with no frank or occult rupture of the uterus. There were no maternal deaths; the uncorrected fetal mortality was 4 per cent.

The adage, "once a cesarean section, always a section," does not, in modern-day obstetrics, have the same connotation it formerly had. Repeated violation of the anterior paries and the pregnant uterus can be prevented in many cases of previous cesarean section by proper and complete clinical, physical, and radiological evaluation. —*Charles Baron, M.D.*

TABLE I

Previous C.S.	Following deliveries: laparotomy						Vaginal						Maternal mortality	
	C.S.		rupture		Total		Spont.		instrum.		Total			
Cases	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
197	98	49.7	25	12.7	123	62.4	58	29.4	16	8.1	74	37.5	3	1.5

Repeat Cesarean Section and Resistance of the Scar (Wiederholter Kaiserschnitt und Narbenresistenz). N. Louros, P. Gavaris, and N. Barous. *Deut. med. Wschr.*, 1958, 83: 963.

The newer indications for cesarean section have resulted in an increase of cases in which one or even several cesarean sections have been performed previously. At the State and University Maternity Clinic "Alexandra" in Athens, Greece, the average yearly number of deliveries is cited as 4,000. In the past 5 years, the incidence of cesarean section has almost doubled, and now comprises about 1 per cent of all deliveries.

Before the advent of antibiotics, sterilization after the third cesarean section was almost mandatory in order to protect the health of the mother. Now, since infection may be combated more readily, this practice of sterilization is slowly disappearing. Many obstetricians still adhere to the American dogma "once a section, always a section," but the authors believe that this decision must depend on the resistance of the scar.

Over a period of 5 years, they have collected data on 197 pregnancies of women who had had at least one previous cesarean section. However, only 64 of these had the surgery performed at the hospital of the University. Cesarean section was employed in 49.7 per cent of the women who had previously been delivered by this technique (Table I).

According to the American figures, the incidence of scar ruptures is 4 per cent but the authors found an incidence of 12.7 per cent. It must be noted that 40 per cent of these ruptures occurred before the patient was admitted to the hospital. A ruptured uterine scar was responsible for the death of 3 of the 197 women (1.5 per cent). There were 34 perinatal deaths (16.6 per cent) occurring in 204 newborns. Fourteen of these children died as the result of uterine rupture. However, 10 of these deaths occurred outside the hospital; the corrected mortality figure is therefore 9.8 per cent.

At the hospital of the university, repeat cesarean section was found to be necessary in only 31.2 per cent of those who had placenta previa previously. Of these, uterine rupture occurred in 6.2 per cent of the cases.

It is interesting to observe the figures concerning the time interval between the preceding cesarean section and the following delivery. When the previous cesarean section was done less than 2 years previously, the incidence of scar rupture was 27 per cent; whereas if the interval was greater than 2 years this figure was reduced to 4 per cent.

The authors believe that the scar will be more solid and resistant to rupture if the section is performed long before full dilatation occurs, and if too prolonged pressure is avoided on the lower uterine segment. The authors also stress the importance of the following clinical signs: (1) sensitivity of the abdominal scar; (2) edema of the anterior lip of the cervix; (3) irregular uterine contractions, and prolonged labor.

With the incidence of scar rupture previously cited, it becomes more and more evident that the entire clinical picture of the case at hand must be reviewed and studied before the decision can be made that a spontaneous delivery is possible.

—*Sylvain Van de Rijn, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

The Potter Syndrome of Renal Agenesis. R. G. WELCH. *Brit. M. J.*, 1958, 1: 1102.

IN 1946 POTTER, in a study of a 20 case series, called attention to a syndrome of bilateral renal agenesis associated with a characteristic facies. Changes about the eyes, nose, and chin, and enlargement of the ears gave a suggestion of premature senility. The authors present details of 5 such cases and suggest that this may not be a very rare occurrence.

Both kidneys and ureters are usually absent, the position of the kidneys being occupied by flat disc-like adrenal glands. When there is a ureter, some identifiable renal tissue may develop, the stimulus of the ureteric bud from the Wolffian duct apparently being necessary before differentiation of nephrogenic tissue into glomeruli and secretory tubules can occur. Thus, it is noted that in one of the 5 cases a right ureter was present and an associated aplastic kidney. In the other cases the kidneys and ureters were absent. The bladder may be present as a narrow thin-walled sac extending up toward the umbilicus.

Hypoplastic lungs resembling those in a younger fetus are described as part of the syndrome and, as might be expected, other congenital malformations are often found, the majority involving the lower limbs.

Only a few of the infants have lived beyond a day, but Woolf and Allen (1953) have recorded an exceptional instance of a child who lived without kidneys for a period of 39 days.

—*Allan K. Swersie, M.D.*

Misdiagnoses Based on Renal Anomalies (Fehldiagnosen verursachende Nierenanomalien). K. MARTON. *Zschr. urol.*, 1958, 51: 218.

RENAL ANOMALIES are observed in 2 to 3 per cent of all operations on the urinary organs and found in .5 to 1 per cent of the autopsies. The author gives a very detailed classification of renal anomalies based on embryologic morphology. Nineteen pictures of very well selected urograms pertaining to the cases reported illustrate these studies. Polycystic kidneys comprise the largest group of anomalies (figures not quoted). Dystopias are found in 1 autopsy out of 2,000 on the left side and in 1 out of 3,000 autopsies on the right side.

Bilateral dystopias are more frequent in women. True dystopy must be differentiated from dropped kidney. A wandering kidney has a meandering ureter. Crossed dystopias are seldom bilateral.

The indications for operation on dystopic kidneys are outlined. Surgery for polycystic kidney is out of the question. Horseshoe kidneys are discussed in detail with respect to diagnosis and operative approach.

Since symptomatology of renal anomalies is not specific and may be masked so that it simulates gynecologic or other abdominal conditions, only thorough urographic studies and search for possible anomalies will safeguard against error. —*Otto Weiss, M.D.*

The Movable Kidney and Its Surgical Treatment (Ueber die bewegliche Niere und ihre operative Behandlung). JAAKKO S. AALTO. *Ann. chir. gyn. fenn.*, 1958, 47: Supp. 72.

THE AUTHOR discusses the etiology, symptomatology, and the surgical treatment of movable kidney. He presents a comprehensive review of the literature and reports on 25 personally observed cases from three hospitals in Finland.

A number of factors predispose to the genesis of renal ptosis. The anterior and posterior sheaths of the perirenal fascia do not fuse at the lateral and inferior aspect in many cases, especially in women. The diastasis of both sheaths at this site is larger in women than in men; this is one reason why ptosis is much more frequent in women. In the author's cases there were 3 men and 22 women. Furthermore, any condition that decreases the intra-abdominal pressure may contribute to loosening of the kidney fixation. These conditions include poor tonus of the abdominal muscles, especially after repeated pregnancies, emaciation with loss of the perirenal fat tissue, and heavy physical exertion in standing position.

Movable kidney occurs much more frequently on the right side than the left or bilaterally. In all 25 of the author's cases the right kidney was involved. It is assumed that the reason is poorer fixation of the right kidney and pressure of the liver.

Ptosis of the kidney may cause kinking of the ureter, stenosis, and finally hydronephrosis. Furthermore, ptosis can be associated with rotation of the kidney which, in turn, leads to torsion of the pedicle and venous stasis. Other sequelae may include ptosis of the duodenum, the hepatic flexure, and the ascendant colon with disturbances in the function of these organs.

As to the symptomatology, the author differentiates between monosymptomatic and polysymptomatic forms. The monosymptomatic cases are characterized by colic in the lumbar region irradiating to the abdomen. There may or may not be chills, nausea, vomiting, and fever. Other patients complain of continuous dull pains without episodes of colic. The polysymptomatic forms are characterized by backache, gastrointestinal disturbances, constipation, and general fatigue.

Although in thin patients the displaced kidney can be palpated the diagnosis is established mainly by intravenous and retrograde pyelography. The degree of ptosis as well as stenosis and kinking of the ureter can only be visualized by these methods.

In cases which are not improved by palliative methods the treatment of choice is surgical nephropexy, with or without decapsulation. Although this operation has been performed for more than fifty years and hundreds of different methods have been described in the literature there still is no consensus as to which technique is best. Closure of the floor of the fossa renalis alone is not sufficient for fixation. Application of talcum or iodine to produce adhesions

may cause ischemia and compression of the parenchyma. Sutures through the parenchyma may cause local sclerosis, especially if combined with decapsulation. Recurrences after initial success occur with all techniques.

Of the 25 patients observed by the author operation was performed on 20. Complete and permanent cure was achieved in 10 of these, 2 were improved, in 5 the result was poor, and 3 could not be followed up.

—Werner M. Solmitz, M.D.

Regional Hypothermia in Acute Renal Ischemia. PAUL J. STUEBER, JR., STEVEN KOVACS, SIMON KOLETSKY, and LESTER PERSKY. *J. Urol.*, Balt., 1958, 79: 793.

THE AUTHORS studied the effects of regional hypothermia combined with acute renal ischemia which was produced by clamping the renal pedicle for varying periods. Preliminary unilateral nephrectomy was performed. Subsequently, the remaining kidney was exposed and heparin was injected into the renal area. which was followed immediately by the placement of a "bulldog" rubber-shod clamp on the artery and vein. The renal temperature was measured with an intraparenchymally placed glass thermometer. One group of animals had a 6 hour occlusion of the pedicle; in the control group the kidney was exposed and insulated from body heat; in the experimental group the exposed kidney was cooled during the period of anoxia by a water-cooled perirenal plastic jacket.

After a 6 hour period of anoxia alone, the kidney underwent a period of anuria, followed by some urinary output, but with a 100 per cent mortality. A 75 per cent survival occurred when the renal temperature was lowered to between 30 to 40 degrees Centigrade. When the renal temperature was lowered (experimental group) to between 20 to 25 degrees Centigrade, 30 per cent of the animals survived. Histologic studies showed proximal tubular damage with a lesser degree of injury in the cooled group. If hypothermia was employed during anoxia, renal function showed a significant protection as measured by the blood urea nitrogen levels. The authors conclude that localized cooling offers protection in the presence of severe protracted renal anoxia. The increased percentage of survival in the animals, the less severe elevation of the blood urea, and the microscopic evidence of less severe injury were consistent throughout the study.

—David Rosenbloom, M.D.

The Roentgenologic Picture of the Kidney and the Urinary Tract in Chronic Pyelonephritis (Das Roentgenbild der Nieren und der Harnwege bei der chronischen Pyelonephritis). R. DEJDAR and VL. PRAT. *Zschr. Urol.*, 1958, 51: 1.

THE AUTHORS, of the Institute for Circulatory Research in Prague, Czechoslovakia, discuss the roentgenologic findings in chronic pyelonephritis, observed in a series of 96 patients. This disease is the most frequent of all disturbances of the urinary tract and is found in 6 per cent of autopsies.

To obtain a good intravenous pyelogram it is important that the rectum be emptied thoroughly by repeated enemas. The injection of contrast material should be started not later than 30 minutes after the last enema to prevent resorption of larger quantities of water from the colon. To achieve sufficient concentration of iodine in the urinary tract pyelography should be done at the time of lowest diuresis. Twenty cubic centimeters of contrast material are injected within 2 minutes, and radiograms are made 5, 10, and 20 minutes after beginning the injection. The last roentgenogram is made with the patient in standing position. If the kidney is damaged to such a degree that the specific gravity is below 1,015 it can not concentrate the material sufficiently to give a clear picture. Only retrograde pyelography gives useful information in these cases. For this, 4 to 8 c.c. of a 20 per cent solution are sufficient to fill the pelvis. If the solution is warmed to body temperature retrograde pyelography is tolerated very well without untoward reactions.

As the authors did not have a sufficient number of normal persons for purposes of comparison a group of 53 patients with glomerulonephritis was used as control.

It is important to measure and compare the overall dimensions of the kidney. Because of shrinking of the parenchyma the affected kidney is often smaller than the normal. A difference of at least 1.5 cm. was considered significant and was found in 41.6 per cent of cases as compared with only 4 per cent of the patients with glomerulonephritis. Asymmetry in the rate of excretion and unequal concentration was found in 42.8 per cent of those with pyelonephritis as compared with none in the group with glomerulonephritis.

The earliest roentgenologic sign of chronic pyelonephritis is deformation of the calyces and flattening, finally disappearance, of the papillae. Later, dilation of a calyx or of the entire kidney pelvis, delayed excretion, and lowered concentration are observed. Renal calculi were seen in 15.7 per cent of the patients with pyelonephritis. None were found in the control patients with glomerulonephritis.

—Werner M. Solmitz, M.D.

Hyperchloremic Acidosis in Chronic Pyelonephritis. WILLOUGHBY LATHEM. *N. England J. M.*, 1958, 258: 1031.

HYPERCHLOREMIC ACIDOSIS is a characteristic feature of a variety of kidney diseases that have in common impairment of urinary acidification with excretion of an alkaline urine. Among these disorders are renal tubular acidosis and the Fanconi syndrome. In these disorders there are minimum alterations, in the early stages at least, in glomerular filtration and disturbances in renal tubular function which by loss of alkali or impairment of hydrogen ion secretion accounts for metabolic acidosis. It is suggested that the associated hyperchloremia may develop as concentrations of serum bicarbonate, and undetermined anions diminish in the interests of maintaining isotonicity of extracellular fluid, while the serum chloride concentration may remain constant.

Hyperchloremic acidosis is not unique to renal tubular syndromes, but might appear in any renal disease in which impairment of the tubular function and secretion of the hydrogen ion are disproportionately greater than the changes in the glomerular function.

The article deals with a detailed study of hyperchloremic acidosis in 4 patients with chronic pyelonephritis in whom the clinical features were clearly distinguishable from renal tubular acidosis. There were characteristic features differentiating these cases of pyelonephritis from renal tubular acidosis, such as acid urine, hyperkalemia, and the absence of nephrocalcinosis, hypophosphatemia, and osteomalacia.

The mechanisms of acidosis and the hyperkalemia may tentatively be attributable to a disturbance in renal tubular function with impairment of the secretion of hydrogen and potassium ions. In other forms of renal disease with acidosis of the degree manifested in these patients with pyelonephritis, hyperkalemia is infrequent. This suggests that factors other than alterations in the acid-base balance may be responsible. Assuming impaired tubular secretion of potassium to be a factor, this derangement would be consistent with other evidence of tubular dysfunction in pyelonephritis and with pathological evidence of tubular destruction.

Since the urine in chronic pyelonephritis is acid, the metabolic acidosis cannot be attributed to loss of alkali as may occur in renal tubular acidosis and the Fanconi syndrome, in which alkaline or neutral urine is found. Impaired hydrogen ion secretion must be inferred. The differences in the urinary pH is useful as a distinguishing clinical feature.

The cases are presented with clinical detail and laboratory data. There is an extensive discussion of hypotheses dealing with phases of hyperchloremic acidosis due to chronic pyelonephritis.

—*Allan K. Swersie, M.D.*

Nephrocalcinosis and the Formation of Calculi in Relation to Disturbances of Calcium Metabolism (Nephrokalzinose und Steinbildung in ihren Beziehungen zu Stoerungen des Kalkstoffwechsels). V. UNGER. *Zschr. Urol.*, 1958, 51: 69.

THE TERM, nephrocalcinosis, first coined by Albright in 1934, is reserved for conditions in which roentgenologically demonstrable calcifications of the renal tubules occur. The number of such cases in the world literature is comparatively small. Normally the serum calcium level ranges from 7 to 8.5 mgm. per cent. The daily excretion of calcium in the urine varies from 100 to 150 mgm. per cent. If an excessive amount of calcium is excreted in the urine (hypercalciuria), it can be detected by means of Sulkowitch's test. Hypercalciuria is found in cases of hyperparathyroidism, osteoporosis, complicated fractures, osteomyelitis, and bone tumors.

The normal values of calcium and phosphorus in the serum are as follows:

Calcium	8.2–11.0 mgm. %
Phosphorus (organic)	0.0– 4.0 mgm. %
Phosphorus (inorganic) (adults)	2.4– 4.4 mgm. %
Phosphorus (inorganic) (children)	4.4– 7.0 mgm. %
Phosphoratase (alkaline)	2.5– 5.0 units
Phosphoratase (acid)	0.1– 1.0 units

Nephrocalcinosis can occur in the following conditions: primary hyperparathyroidism, renal acidosis, Fanconi's syndrome, milk-alkali-syndrome (Burnett's syndrome), D-hypervitaminosis, acute osteoporosis, malignant bone metastases, multiple myeloma, Paget's disease, and Boeck's sarcoid.

The effect of these diseases on the calcium and phosphorus values in the blood and urine is shown in Table I.

Hyperparathyroidism is the cause of two-fifths of all cases of nephrocalcinosis. According to Hellstrom 80 per cent of patients with hyperparathyroidism have either nephrocalcinosis or nephrolithiasis. Hyperparathyroidism in the presence of nephrocalcinosis is a relatively easy diagnosis to make. There is a marked elevation in the urinary excretion of calcium, the blood calcium is elevated, and the level of phosphorus is diminished. The alkaline phosphatase is also elevated. The blood calcium and phosphorus levels vary during the disease and must be repeatedly re-evaluated in order to detect their abnormal relationship. At least four determinations of serum calcium and phosphorus should be made. During the investigation the patient is given a diet high in calcium which will normally increase the calcium excretion in the urine, but will not raise the level of the calcium in the blood.

According to Boyce, Garney, and Norfleet there is an increase of mucoprotein in the urine of patients who have a parathyroid adenoma. The mucoprotein combines with calcium to form an insoluble complex in the urine. Baker and Connelly have shown that the

TABLE I.—CALCIUM AND PHOSPHORUS VALUES IN VARIOUS DISEASES

	Hyperpara.	*Renal acid.*	*Fanc. synd.*	*Burnett*	*D-Hypervitam.*	*Osteopor.*	*Malig. metast.*	*Mult. myel.*	*Paget's dis.*	*Boeck's sarcoid*
					SERUM					
Calcium	e	n-/	n	e	e	n	n-e	e	n	e
Phosphorus	/	n	n	n	e	n	n-e	n	n-e	n
Phosphatase alk.	e	n-/	n-e	n	n	n	n	n	e	e
Phosphatase acid	n	n	n	n	n	n	e	n	n	n
Bicarbonate	n	/	n	e	n	n	n	n	n	n
Cl	n	e	n	/	n	n	n	n	n	n
Na	n	/	n	n	n	n	n	n	n	n
K	n	/	n	n	n	n	n	n	n	n
NPN	n	e	n	e	n	n	n	n	n	n
					URINE					
pH	a	alk	a	alk	a	a	a	a	a	a
Ca	e	e	e	n	n-/	e	n-e	n-e	n-e	n-e

Symbols: e—elevated /—diminished n—normal a—acid alk.—alkaline

cells of the renal tubules in the presence of hyperparathyroidism contain an abnormal amount of mucopolysaccharide and Honard has demonstrated that this substance forms the nucleus of renal stones in this disease.

The next most frequent cause of nephrocalcinosis is so-called renal acidosis or hyperchloremic acidosis. The change in the electrolytes of the serum and the alkaline urine, the acidosis, and hypercalciuria lead to the correct diagnosis of this disease. The phosphorus level of the serum in this condition, in contrast to that in hyperparathyroidism, is elevated.

The Fanconi syndrome and the Burnett syndrome, as causes of nephrocalcinosis, are quite rare.

An excessive intake of vitamin D can, also, lead to the calcification of the renal tubules. When this occurs it is frequently associated with albuminuria, cylindruria, and azotemia.

The presence of osteoporosis as a cause of nephrocalcinosis can easily be detected in the roentgenogram. In the presence of complicated bone fractures and during prolonged immobilization, increased calcium excretion in the urine, osteoporosis, and nephrocalcinosis may occur.

Osteoporosis as a cause of nephrocalcinosis is also seen in women who have passed their menopause, in whom it is due to decreased ovarian function and to disturbance of the citric acid metabolism.

—*S. Richard Muellner, M.D.*

Ureterocele in Infants and Children. F. Douglas Stephens. *Austral. N. Zealand J. Surg.*, 1958, 27: 288.

The author divides ureteroceles into two types, stenotic and sphincteric, depending upon the cause of obstruction. The stenotic ureterocele is caused by intrinsic stenosis of the ureteral orifice, whereas the sphincteric ureterocele is produced by the continuous squeezing action of the internal sphincter during the resting phases of vesical function.

The two types of ureterocele may be distinguished by voiding cystourethrograms. In the case of stenotic ureterocele the cystourethrogram depicts a persistent filling defect during and at the end of micturition. The appearance of the sphincteric type, on the other hand, depends upon the competence of the ureterovesical valve. If the valve is competent the filling defect disappears during micturition when the grip of the internal sphincter is relaxed. If the valve is incompetent the filling defect disappears during voiding only to reappear, filled with opaque medium as a result of reflux, at the end of micturition.

The appropriate surgical treatment is dictated by total renal function and the function of the kidney corresponding to the ureterocele. If it is desirable to conserve the function of the kidney associated with the ureterocele, a minimal division of the roof of both the stenotic and sphincteric ureterocele is advisable. This operation, which may be performed by either suprapubic or transurethral approach, is designed to circumvent the obstructing mechanism. If the function of the corresponding kidney is worthless, nephroureterectomy will suffice in the case of both the stenotic and sphincteric ureterocele, provided the ureterocele empties itself subsequently and does not permit retention of urine by reflux. In the case of sphincteric ureterocele associated with reflux, on the other hand, excision or partial resection of the ureterocele in addition to nephroureterectomy may be necessary.

—*Laurence F. Greene, M.D.*

BLADDER, URETHRA, AND PENIS

The Prophylaxis and Conservative Management of Postoperative Hemorrhage from the Bladder (Zur Prophylaxe und konservativen Behandlung der postoperativen Blasentamponade). E. Schmiedt. *Zschr. Urol.*, 1958, 51: 146.

About 5 per cent of patients will have severe bladder hemorrhage after prostatic surgery. The incidence of postoperative hemorrhage, according to a review of literature, is about the same whether the operation performed was a suprapubic prostatectomy, a retropubic prostatectomy, or a transurethral resection. Postoperative hemorrhage is twice as common in patients over 70 years of age as in those below this age level. To prevent the occurrence of postoperative hemorrhage, all spurting vessels should be coagulated during a transurethral resection. This, however, is not always possible. In open suprapubic surgery, it may be necessary to place a hemostatic stitch in the region of the prostatic artery. It is not advisable to excise a wedge-shaped piece of the trigone with the electrosurgical knife. This method, in fact, favors postoperative hemorrhage.

Burghele's suggestion, to tie off the hypogastric arteries during a suprapubic prostatectomy, also is not recommended as a routine procedure. In the postoperative period it is important to avoid constipation and straining at stool, for these, too, can start bleeding from the prostatic bed. Hypotension deliberately induced during the operation has at times been useful in securing hemostasis. This method, however, is contraindicated if shock occurs as a result of hemorrhage. Blood transfusions are preferable during shock and are helpful in hemostasis.

It is best to avoid the reopening of a suprapubic incision if a postoperative hemorrhage has occurred. The catheter, which is plugged by blood clot, is removed, and a No. 24 or 26 French Nelaton catheter with a Mercier tip is introduced and the clots in the bladder are evacuated by means of a hand syringe. If one has succeeded in emptying the bladder of clot and the large catheter drains freely, it can be left in place for 2 or 3 days. The use of streptokinase or streptodornase is best avoided as a method for disposing of blood clots. Too frequent irrigations of the bladder postoperatively are inadvisable for they can interfere with the normal clotting mechanism in the vessels of the prostatic bed.

—*S. Richard Muellner, M.D.*

An Attempt to Influence the Permeability of the Bladder Wall by Means of Hyaluronidase (Ueber die Beeinflussbarkeit der Blasenwandpermeabilitaet mittels Hyaluronidase). Zoltán Szendröi, Péter Magasi, and Endre Mátyus. *Zschr. Urol.*, 1958, 51: 99.

Various organs and body cavities have been utilized for the purpose of dialysis. The possibility of using the urinary bladder to affect electrolytes in the blood

stream has, in the past, not been considered. Recent investigations have shown that the permeability of the bladder wall can be altered under certain circumstances, and have suggested that the bladder could perhaps be used for the purposes of dialysis.

The intact bladder wall does not permit the resorption of materials from hypertonic solutions, except in very small quantities. This is true, also, of strychnine, pilocarpine, adrenalin, cocaine, potassium iodide, and glucose. For all practical purposes, therefore, the intact bladder wall is impermeable to water and watery solutions. The bladder wall is, also, impermeable to solutions of urea. The bladder wall, however, becomes more permeable when inflamed. If the bladder is to be used for dialysis, the possibility of reversing the direction of the flow, i.e., from the circulating blood into the bladder cavity, would have to be established. For this reason the effect of hyaluronidase, which increases the permeability of many tissues, was investigated.

Experiments conducted on dogs and cats revealed that hyaluronidase permitted the diffusion of some substances, from the blood stream into the bladder cavity. This method was tried on 2 patients; and it was possible to reduce the nonprotein nitrogen of the blood, but only to a clinically insignificant degree. There was no change in the electrolyte values of the blood after dialysis of the bladder in either patient. The possibility of using the bladder for purposes of dialysis must, therefore, be explored further.

—*S. Richard Muellner, M.D.*

Melanoma of the Glans Penis; Its Origin from Elements of the Nerve Sheath (Melanoma del glande; sua documentabile origine da elementi della guaina nervosa). D. Batolo and S. d'Aquino. *Arch. ital. pat. clin. tumori*, 1958, 2: 285.

This biopsy specimen came from the surgical department of the Tumor Center at the University of Messina, Italy. It was removed from the glans of a 50 year old patient, where it evidently formed part of a malignant, degenerated wartlike structure. The original report is accompanied by 14 photomicrographs.

The histologic findings were typical of this type of tumor, but there were certain aspects of the cellular architecture which were of great interest, not only because of the extreme rarity of this location of a melanotic tumor, but also because of the light which they throw upon the pathogenesis.

The epithelial covering was included in the proliferative process; the cells from the overlying epithelium, appearing like raindrops, were large, roughly globular or irregular in shape, and devoid of pigment. In the derma these epithelial cells were mingled with the more fusiform (sarcomatoid), moderately pigmented cellular aggregations of the stromal portion of the skin; these dermal aggregations suggested an origin from the mesenchyma or connective-tissue component of the derma.

Of greater interest, however, were the findings in the deeper portions of the subcutis; here nerve branches were observed to be participating in the neoplastic process, a finding emphasized in 1926 by Masson, who believed that these tumors took origin from the cells of Schwann. There were within the nerve sheaths some agglomerations of small, round or polygonal, deeply pigmented cells which gave the impression of having been derived from the cells of Schwann. In the main, however, the cellular aggregation within the nerve sheath was of a more sarcomatous type, and here and there appeared to be bursting through the nerve sheath itself; there were even certain abnormal cells which gave the impression of being large meissnerian ganglionic cells.

The author believes that the neoplastic process in this instance originated in the perineurium.

—*John W. Brennan, M.D.*

GENITAL ORGANS

Vesiculography as a Diagnostic Aid in Cancer and Hypertrophy of the Prostate. M. Gerner-Smidt. *Acta chir. scand.*, 1958, 114: 387.

The author discusses vesiculography as a diagnostic aid in differentiating between hypertrophy and cancer of the prostate.

Roentgenographic study of the male internal genitalia has been discussed since 1913, beginning with Belfield. The contrast media have usually been injected through the ductus deferens and usually for purposes of investigating inflammatory conditions or sterility. Boreau, in 1953, was among the first to use this modality of study in relation to tumors.

It is to be expected that vesiculograms would reveal differences between cancer and hypertrophy of the prostate. In hypertrophy, the paraurethral glands increase and create the distortions. In cancer, the pathological changes are situated in the peripheral and posterior parts. The coexistence of hypertrophy and cancer would be a complicating factor.

Diagrammatic vesiculograms representing findings in normal, hypertrophic, and malignant prostates are presented. In the normal vesiculogram the vas courses medially and downward, becoming markedly tortuous but relatively narrow before entering the seminal vesicles. There may be changes due to anatomical variations or old inflammatory conditions. This applies particularly to the seminal vesicles. The angle formed by the two seminal vesicles is termed the intervesicular angle and normally should be less than 90 degrees.

When prostatic hypertrophy exists there is an increase in the intervesicular angle and the size and density of the seminal vesicles. These changes are due to lateral pressures against the vesicles by the growing adenoma and by compression of the ejaculatory ducts with stagnation of vesicle secretions.

Boreau has investigated in detail the vesiculographic appearance of prostatic cancer. Irregularity and asymmetry are the most important findings. The seminal vesicles are most frequently of unequal size and density, and often displaced. Such displacement laterally, plus changes in the level of the entrance of the vesicles into the deferens, is in Boreau's opinion, the first sign of cancer. Destructive processes in the prostate may be visualized as filling defects.

The author has conducted vesiculographic studies in 14 cases of prostatic hypertrophy and 14 cases of advanced cancer of the prostate, and compares his findings with those of previous investigators.

In prostatic hypertrophy, in 11 of the 14 cases in which the excised prostate weighed over 50 gm., the intervesicular angle was distinctly increased. In 3 patients with normal intervesicular angles the prostate weighed 30 to 40 gm. The size of the seminal vesicles varied, but they were visualized on both sides and were of equal size and configuration. This is at variance with earlier descriptions by other workers of very large and wide seminal vesicles.

In all of the 14 cases of prostatic cancer, the roentgenograms were largely characterized by irregular structures and incompletely filled systems, probably due to destructive or infiltrative processes. These roentgenograms differed distinctly from the "quiet" regular picture seen in patients with hypertrophy. It was not possible to duplicate Boreau's findings of lateral displacement of the systems.

Vesiculography may be used as a diagnostic aid with the limitation that malignancy cannot be ruled out even when a hypertrophic vesiculogram is obtained. In the presence of increased phosphatase values (and metastases) associated with suspicious prostatic palpatory findings, vesiculography is superfluous. The author intends to use vesiculography in cases in which the rectal findings are the only evidence in support of a diagnosis of cancer. When this diagnosis cannot be supported by the vesiculogram, histological examination of a biopsy specimen or of the removed gland is necessary.

The article presents the details of injection and roentgenographic technique as well as vesiculograms illustrating the points discussed.

—*Allan K. Swersie, M.D.*

Relationship Between Prostatic Hypertrophy and Carcinoma of the Prostate (Ueber die Beziehungen zwischen Prostatahypertrophie und Prostatacarcinom). WALTER DONTENWILL and HEINRICH WULF. *Arch. Geschwulstforsch.*, 1958, 12: 4.

THE AUTHORS, of the Pathologic Institute of the University of Kiel, Germany, studied the question of whether hypertrophy of the prostate can be considered as a "precancerous" lesion; in other words, whether carcinoma occurs more frequently in patients who have a hypertrophic prostate than in those who do not.

There is a wide discrepancy of opinion in the literature on this question. A number of workers believe that hypertrophy of the prostate predisposes to malignancy, and that for this reason treatment with testosterone is contraindicated in hypertrophy. In contrast to this, other workers believe that carcinoma originates from malignant degeneration of an adenoma and has no relation to hypertrophy, which they consider as a benign proliferation of the paraurethral glands. According to this theory it is probable that increased production of female sex hormone is the cause of prostatic hypertrophy whereas in development of carcinoma a carcinogenic effect of male sex hormone is active. This assumption is confirmed by the antiandrogenic effect of follicle hormone in the hormonal therapy of carcinoma. If this theory is correct carcinoma and hypertrophy should exclude each other to a certain degree.

To decide the question the authors studied a series of 880 biopsies performed on patients with hypertrophic prostates examined at the Pathologic Institute from 1942 to 1951. Of these, 436 patients could be followed up for 3 to 5 years. In only 12 of them was subsequent development of carcinoma observed. This proportion of 2.75 per cent corresponds exactly to the over-all incidence in all male autopsies (3,873 cases).

The authors conclude from these statistics that carcinoma does not occur more frequently in men with hypertrophy of the prostate than in the average of the male population. —*Werner M. Solmitz, M.D.*

Diethylstilbestrol Diphosphate, "Honvan" (ST 52—Asta), in Intravenous, Tumor Specific, Chemotherapy of Metastatic Carcinoma of the Prostate. C. C. HANSEN. *Acta chir. scand.*, 1958, 114: 398.

A TOTAL of 20 cases of cancer of the prostate treated with honvan (diethylstilbestrol diphosphate) is considered. This diphosphate compound is freely soluble and becomes active after intracellular conversion into highly cytotoxic diethylstilbestrol via dephosphorylation by phosphatases of the prostate.

Diagnosis of cancer was made on the basis of the usual exacting accepted criteria.

Serum phosphatase determinations were of primary importance in the investigation, proving to be a reliable diagnostic aid and serving as a basis for individual adjustment of dosages of honvan. Assuming the mechanism of action of this compound to be essentially cytostatic, the dose must be adjusted to the total amount of metastatic tissue present in the patient. Determination of this factor is based on values of alkaline, total acid, and prostatic phosphatases obtained at regular controls. These values should all return to normal before the cancer can be regarded as being adequately inhibited.

In patients previously treated vigorously with stilbestrol a certain "resistance" to honvan was found and relatively small fluctuations in all the phosphatase values were obtained during the latter therapy.

With progression in honvan treatment, changes in values of total acid, alkaline phosphatases, and prostatic phosphatases occur and are discussed as a basis for the diagnoses of recurrence of cancer and therapy. The prostatic phosphatase values were found more useful in this regard than the total acid phosphatase.

The dosage schedule is relatively higher than that recommended in the general literature. An intravenous dosage of 750 mgm. daily is given for 10 days in a 500 c.c. glucose saline infusion. This is decreased to 500 mgm. daily until the acid and prostatic phosphatase values approach normal and the alkaline phosphatase begins to fall. After another 10 day period with continued improvement in the phosphatase values as determined by weekly controls, the dosage is reduced to 250 mgm. daily. Cases are individualized, and may be reduced to a schedule of 250 mgm. once or twice weekly, under monthly control. The highest total dose given in this study was 130,000 gm.

The effects obtained by honvan treatment were: less difficulty in urination (15 patients), decrease in metastatic pains (15), roentgenographic regression of metastases (7), and a fall in all serum phosphatase values after an initial increase in serum alkaline phosphatase.

There were side effects which in highly sensitive patients could be decreased by intravenous drip infusion of a highly dilute solution. Reactions included anal pains, dizziness and nausea, conjunctivitis, mild hormonal reactions, facial reddening, and circulatory disturbances. The latter reaction is discussed in considerable detail.

Treatment with honvan (diethylstilbestrol diphosphate) is considered superior to other forms of estrogen therapy and is of value, although less effective, even in cases in which stilbestrol has failed.

—*Allan K. Swersie, M.D.*

MISCELLANEOUS

The Diagnosis and Therapy of Urinary Incontinence (Diagnostik und Therapie der Harninkontinenz). JOHANNES FISCHER. *Zschr. Urol.*, 1958, 51: 129.

THERE ARE many reasons for urinary incontinence in men, women, and children. To treat urinary incontinence, a precise diagnosis is necessary. A careful history, a thorough physical examination, and a complete urologic investigation, including cystometry, will usually lead to the proper diagnosis of the condition.

In men of prostatic age, urinary incontinence can be due to a so-called "overflow" bladder. In these patients the bladder has decompensated, and it is worth noting that incontinence may persist for a considerable period of time after the obstructing prostate has been removed.

Tabes dorsalis, as a cause of urinary incontinence, is readily established by means of a careful physical examination and cystometry.

In women multiple deliveries and cystoceles may be associated with urinary incontinence of various degrees. A cystocele, however, is not necessarily the sole cause of incontinence. These patients are usually relieved by plastic operations. In some women urinary incontinence is associated with contraction of the vesical neck. The bladder in these cases is apt to be somewhat smaller than normal, and the cystometric curve shows hypertonicity. These patients can be made infinitely worse by a vaginal plastic procedure. Transurethral resection of the vesical neck often relieves this type of incontinence.

In children it is important to consider congenital abnormalities as a cause of urinary incontinence. The history should reveal whether the child has had diurnal urinary control. In children with enuresis, cystometry, in addition to cystoscopy, can be helpful in the determination of the cause of the enuresis. In the management of enuresis the patient is instructed to stop the ingestion of fluids about 4 hours before bed time and to empty the bladder before retiring. It is often helpful to determine how soon after the onset of sleep the child is apt to wet the bed. If the child is awakened before that period of time, an "awakening reflex" will eventually be established and the incontinence may gradually improve. Some enuretics have a large, over-distended bladder. The tonicity of the bladder can be improved in these cases by the use of an indwelling catheter which is maintained for a period of a few weeks.

—*S. Richard Muellner, M.D.*

Management of Urological Complications in 1,000 Paraplegics. R. CARL BUNTS. *J. Urol.*, Balt., 1958, 79: 733.

MANY UROLOGICAL SURGICAL PROCEDURES are necessary to treat the complications resulting from cord injury or disease and the complications that arise during rehabilitation of the patients. Six hundred twenty-three of 1,000 patients had 723 urological operative procedures. These statistics do not include 500 additional cystoscopic removals of bladder calculi, and 50 additional neurosurgical procedures used in the urological care of these 1,000 patients.

The incidence of operative procedures for the removal of calculi in the upper urinary tract of 1,000 patients was 5.7 per cent. Since symptoms are rarely present in these patients, one must depend upon the routine use of excretory urography in the paraplegic who has an elevation of temperature of undetermined origin. Among these 57 patients, 42 had renal calculi and 15 ureteral calculi; 9 were bilateral and 48 unilateral. The surgical principles for the management of upper urinary tract calculi are essentially the same in the paraplegic as in the nonparaplegic. Only one patient in this series required nephrectomy.

Nephrostomy drainage has rarely been necessary. Repeated examinations and continuous observation have resulted in the early detection and correction of factors that might lead to renal destruction, thus obviating the necessity of nephrostomy drainage.

Cystostomy as a means of drainage has not been used. The number of patients who acquired reflux of clinical significance was 13.6 per cent. In the series presented, in 22 per cent the condition was irreversible and required vesicoureteroplasty. Transurethral resection of the bladder neck was performed on 188 (18.8 per cent) of the patients presented. It is recommended that transurethral resection should be postponed, if possible, until all conservative methods for bringing the bladder into balance have been attempted. One should wait at least one year before resection is performed.

There has been a marked decrease in the number of patients who acquire urethral fistulas and diverticula, and a greater decrease in the number who require surgical correction. It is noted that the paraplegic patient withstands urological surgical procedures unusually well. There were 2 postoperative deaths following 723 operative procedures.

—*Ray C. Johnston, M.D.*

Fluid Supply Apparatus for Cystoscopy and Transurethral Operations. FREDERIC E. B. FOLEY. *J. Urol.*, Balt., 1958, 79: 896.

IRRIGATING FLUID is one of the essentials in performing endoscopic examinations in the treatment of the urinary tract. The efficient and safe performance of endoscopic techniques requires the use of irrigating fluid under pressure and often changing pressures, as well as various types of fluids during the performance of these techniques. For many years the standard method for supplying irrigating fluids and mixtures under pressure has been the use of the open top percolator with its height adjusted by the use of rope over ceiling pulleys. Although adequate, certain disadvantages are inherent in this technique, such

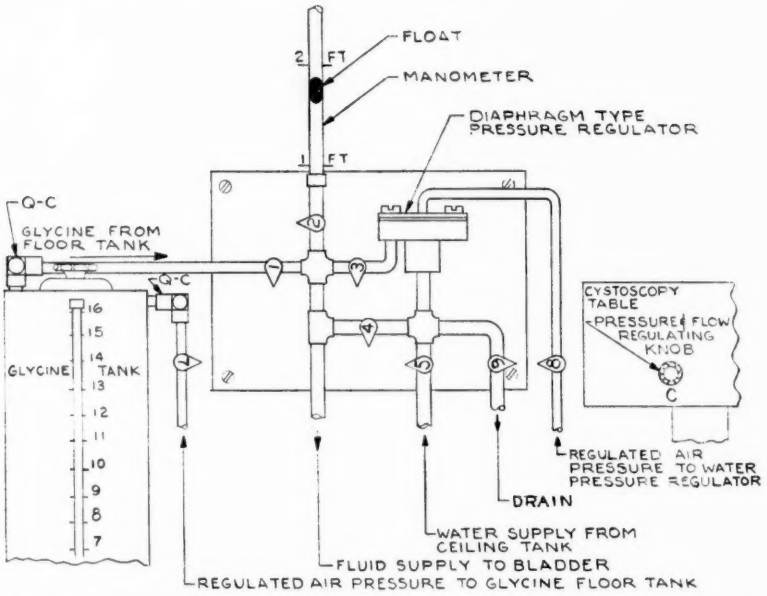


FIG. 1 (Foley). Schematic drawings showing apparatus installed with cystoscopy table. All fluid-directing valves 1 to 6 and air-directing valves 7 and 8 are shown in closed position. When valve number is horizontal (4) valve is closed; when upright (4) valve is open. Remote pressure and flow control instrument (C) is mounted on cystoscopy table where it may be operated by surgeon or assistant. It is an extremely sensitive and accurate air pressure regulator. It is supplied with initial air pressure of 20 p.s.i. from air line of room temperature thermostat present in most hospital rooms. Functions of apparatus are provided by opening the required valves.

as the necessity for alteration of the pressure and flow rate during the filling of the percolator, and the difficulty of sterilization.

The author has designed and produced a fluid supply apparatus which combines the many advantages of the percolator, while eliminating its most serious disadvantages. He has combined a sensitive water pressure regulator and hypersensitive air pressure regulator in an apparatus which can supply irrigating fluid to the endoscopic instrument effectively and efficiently.

The apparatus consists of a diaphragm type of pressure regulator into which air is fed under regulated pressure. Likewise, water is fed through a central intake into the diaphragm type of pressure regulator from an above the ceiling tank with a 9 foot head. A manometer is so placed within the system that the flow of water into the bladder is under constant pressure observation. A pressure instrument with remote control is mounted on the cystoscopic table in such a manner that the operator or his assistant may at any time regulate the rate of flow and the pressure.

A second feature of this apparatus is the adjacent supply tank into which water can be directed through the previously described system to be used in preparing desired irrigating mixtures. This 16 gallon tank has supplied to it a regulated air pressure flow. Closure of the valves between the manometer, the central flow to the bladder, and the water from the ceiling tank, while opening the valves between the manometer, the flow to the bladder and the irrigating tank permits the flow of the irrigating mixture into the bladder under the control of the remote pressure and the flow-control instrument mounted on the cystoscopic table previously described. This remote pressure and flow-control instrument is an extremely sensitive and accurate air pressure regulator. It is supplied with initial air pressure of 20 p.s.i. from the air line of the room temperature thermostat present in most hospital rooms.

The function of the apparatus is the exact equivalent of the function of the adjustable height percolator. It has many of its advantages, but few of its undesirable features. —*Peter L. Scardino, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Surgical Management of Giant Cell Tumors of Bone (La conducta quirurgica en el tratamiento del tumor de celulas gigantes o a mieloplaxas de los huesos). DAGMAR A. CHAVES. *Rev. ortop. traumat.*, 1958, 3: 36.

CAREFUL, thorough curettage combined with filling of the defect with bone chips is indicated in most "virgin" tumors and in those previously curetted once or twice. Its use is justified in tumors of established benignity which are not complicated by pathologic fractures or fistulas. The procedure is simple, permits complete ablation of the lesion with maximum potential of functional restoration, and permits complete examination of the curetted material. Immediate favorable results are obtained in 72 to 80 per cent of cases.

The disadvantages of curettage include the possibilities of hemorrhage and infection, the possible stimulation of malignant degeneration (mentioned by various workers), the difficult approach to certain regions, and the frequency of recurrences. The causes for failure include previous or simultaneous radiotherapy, technically inadequate operations, and the nature of the tumor. The "pseudo-inflammatory" type is not suitable for curettage.

Resection is being used with increasing frequency. The techniques available include simple resection (patella, upper fibula), simple excision (small tumors at the knee) with preservation of bony continuity, resection with insertion of bone graft, resection of a femoral head with arthrodesis, and resection with replacement by a metallic or acrylic prosthesis. Amputation is rarely indicated.

The author's last 6 cases are described.

—Jonas Brachfeld, M.D.

Flexion Spasms and Contractures in "Spinal Cord Disease." GEOFFREY PLATT, W. RITCHIE RUSSELL, and R. G. WILLISON. *Lancet*, Lond., 1958, 1: 757.

THE LATE STAGES of "spinal cord disease," disseminated sclerosis, are often associated with extreme degrees of flexion and adduction deformity of the legs. Contractures and spasms combine to cause pain, and they may make the sitting position impossible. The distress and deformity are often made worse by the loss of sphincter control and bedsores.

We are increasingly aware of the possibility of prevention. Thus, a patient with spastic paraparesis who can stand and walk a few steps every day will maintain a predominance of tone in the extensor muscles sufficient to prevent any serious tendency toward flexion spasms. However, should such a patient have to go to bed even for a few days—on admission to hospital—the lack of standing exercise apparently allows the flexors to "take over." If the muscles quickly shorten, contractures will develop and the patient may never again be able to stand or walk. Thus, in cases in which this disease has caused severe paraplegia, a day or two in bed may lead to the permanent loss of all capacity to be other than chair-ridden or even bedfast. Hemiplegics, on the other hand, should not be allowed to develop flexion deformities, because all hemiplegics can maintain extensor tone in the affected leg.

When going to bed is unavoidable in a patient with spinal cord disease, several measures should be taken to prevent flexion spasms. In the first place, if the general condition permits, a few minutes of weight-bearing every few hours is of great value. Second, all such patients should lie prone for several separate periods each day according to the severity of their disease.

Once the contractures have formed, it is necessary to introduce some extra mechanical force to counteract the deforming effect of the muscles involved. There are many different ways in which this can be done, but the following principles may be identified:

1. Prolonged gentle pressure by springs, traction, or turnbuckle plaster is not usually suitable, because the skin will not tolerate the forces required.

2. The skin will, however, tolerate great pressure for limited periods. If skillfully applied, such pressure constitutes a very powerful means of countering and correcting flexion contractures. Thus, a pressure of 100 pounds applied by a sling to knee or ankle is well tolerated for 30 minutes, three or four times daily, and this can be followed with advantage by a period of lying prone.

3. One very effective method of pulling out the contracture at the knee, which often develops, is to place the patient prone and hang a weight on the patient's heel, which projects beyond the mattress.

In severe cases operation may give excellent results by one or all of the following procedures: obturator neurectomy, division of the tendon of the iliopsoas muscle, transplantation of the hamstring tendons to the back of the femur, division of the nerves to the gastrocnemius muscle, and section of the Achilles tendon.

These combined operations can be used to give great relief to patients with flexion contractures and spasms due to spinal cord disease.

—C. Fred Goeringer, M.D.

Calcific Tendinitis (Tendinitis Calcarea) of the Shoulder Joint. ORED ARNER, NILS LINDVALL, and AKE RIEGER. *Acta chir. scand.*, 1958, 114: 319.

THE AUTHORS report on a series of 102 shoulders presenting calcific tendinitis which were observed in the Department of Surgery and Roentgenology at Karolinska Medikokirurgiska Institute, Stockholm, Sweden. They review the literature pertaining to the incidence, histogenesis, and etiology of this condition, of which the cause is unknown. Trauma is not a substantial causative factor in their opinion.

Calcific tendinitis may be acute, subacute, or chronic. In the acute and chronic forms the episode of

pain, restricted motion of the shoulder, and tenderness, with some elevation of the temperature, are sudden in onset. In the subacute form the same symptoms are dominant, but to a lesser degree. In the chronic form, the patient has repeated episodes of shoulder disability for months. Occasionally this type may undergo acute exacerbation and may require therapy.

Treatment consists of physiotherapy, x-ray therapy, ACTH, hydrocortisone, aspiration of the calcific deposits with the injection of novocain. De Palma suggests an operative procedure for the acute type, in which an incision is made over the anterior aspect of shoulder joint with evacuation of the calcific deposits.

In the authors' series of 85 patients there were 102 shoulders involved. There were 43 men and 42 women. By and large, most of the authors' patients received x-ray therapy with cessation of the pain in approximately 10 days. Other forms of treatment pursued in their own clinic varied from the use of analgesics, aspiration, and long range physiotherapy. The final end results were assessed as good in 88 shoulders and poor in 14.

Calcific tendinitis was usually found in supraspinatus tendons. However, it could involve any other adjacent tendons or bursae. In 48 of the 102 shoulders, the calcium deposits completely disappeared; in 33 shoulders they decreased markedly, but in 8 they failed to disappear completely. Accompanying this informative presentation are many tables and excellent roentgenographs. —*Samuel L. Governale, M.D.*

Tennis Elbow; A Re-Evaluation. BELA GONDOS. *Am. J. Roentg.*, 1958, 79: 684.

A STUDY of 20 cases of tennis elbow, observed during a 2 year period in the dispensary of the United States Army at the Pentagon, is presented. During this study it became evident that tennis elbow clinically and roentgenologically cannot be distinguished from periarthritis calcarea of the elbow. In 7 out of 20 cases of tennis elbow, calcium salt deposition adjacent to the lateral epicondyle of the humerus was discovered on roentgenographic examination. This figure was compared with the incidence of calcification in painful shoulders during the same period of time. The percentage of incidence was found to be very close (35:38). In another statistical study, the relative incidence of calcification at the lateral and medial epicondyles (discovered by roentgenographic examination) was compared with figures of clinical involvement on the lateral and medial aspects in tennis elbow. The relative incidence was almost identical (7:1) in both conditions. A roentgen study of anatomic specimens of humeri revealed that the appearance of a faint bony shadow at the lateral epicondyle is a variation of the normal; this had been in the past misinterpreted as calcium salt deposition or periosteal new bone formation and had been considered to be the underlying cause of tennis elbow. It is concluded that the syndrome of tennis elbow is not a separate entity, but that it represents a manifestation of periarthritis calcarea at the lateral epicondyle of the humerus.

Limitation of motion is commonly present. The pain is generally precipitated by active contraction of the extensor muscles of the forearm or by passive stretching of their common tendon which is inserted at the lateral epicondyle of the humerus. In active contraction of the muscle, the pain is more marked if effort is made against resistance.

The etiology and pathogenesis of this condition is obscure and so far no agreement has been reached as to the nature of the underlying pathologic changes. The following is a list, probably incomplete, of the pathologic changes suggested: bursitis, adventitious bursitis, tear of the muscular attachment of the extensor carpi radialis brevis muscle with subsequent periostitis, fascial tear, myofascitis, periostitis traumatica, arthritis of the radiohumeral joint, synovitis traumatica, and deranged fringes of the synovia. Osgood's concept that a bursa (radiohumeral or Osgood's bursa) is the primary location of the disease has been favorably received by many. The suggested therapy of this disease is generally approached through the concept of the underlying pathologic change. Consequently, the methods of therapy described in the literature are as varied as the concepts of the disease itself. Good results have been reported with different physiotherapeutic methods and conservative orthopedic manipulations, as well as with surgery, both with and without opening of the joint capsule. —*C. Fred Goeringer, M.D.*

Tuberculosis of the Pubis. O. R. NICHOLSON. *J. Bone Surg.*, 1958, 40-B: 6.

TUBERCULOSIS OF THE PUBIS is a rare disease. It is often omitted in textbooks of surgery. This report of 11 cases comes from the Institute of Orthopaedics, Royal National Orthopaedic Hospital, London, and Middlemore Hospital, Auckland, New Zealand.

The ages of the patients varied, but by and large, most of the patients were in the third decade, the youngest being 7 years of age and the 2 oldest were 55 and 68 years, respectively. One typical case history suffices to illustrate the pattern of symptoms, the diagnostic procedure, and the therapeutic management by author.

The boy of 7 complained of pain in the right groin for 6 weeks, with a diffuse swelling over the symphysis pubis. X-rays disclosed an extensive erosion of the body of the right pubis. Biopsy of an inguinal node disclosed a tuberculosis infection. Bedrest, streptomycin, para-aminosalicylic acid, and iso-nicotinic-acid hydrazide were given for 6 months. The patient was dismissed, only to return with an abscess in the groin, which was curetted. The sinus tract persisted for 2 months. Para-aminosalicylic acid and iso-nicotinic-acid hydrazide were given postoperatively and the boy was dismissed 2 months after surgery. Treatment of the rest of the series averaged 3 years. The lesion has a good prognosis and responds well to simple curettage, rest, and medical regime. —*Samuel L. Governale, M.D.*

The Osgood-Schlatter Lesion; A Radiological and Histological Study. B. COHEN and R. W. WILKINSON. *Am. J. Surg.*, 1958, 95: 731.

OPINIONS CONCERNING THE ETIOLOGY of Osgood-Schlatter's disease are divided between those favoring trauma as its cause and those placing it among the

osteochondroses. In treating 11 patients with this disease, the authors were able to remove the tibial tubercle for histological examination in 7 cases.

Histological examination showed separation of the anterior rim of the apophysis from the main body of the tibial tubercle. The tendon was inserted into an area of bone largely surrounded by fibrous tissue. Areas of recent hemorrhage and areas of repair with cellular activity and early fibrosis were found. Ischemia and necrosis of bone were not seen. Areas of early ossification often appeared.

The roentgenogram of this lesion is variable and changes with the stage at which the patient is seen. Soft tissue swelling in the region of the tubercle was seen in most cases. Calcified or ossified tissue may be found in the tendon. Angulation and swelling of the whole apophysis were noted. Radiological changes due to infection or new growth were not present. The good knee did not reveal any change radiologically.

A thorough review of the opinions reported in the literature of this subject is presented and discussed.

The authors conclude that the distinctive histological and radiological findings indicate that the lesion results from dislocation of the appositional structures within the tibial tubercle complex. There was no evidence of underlying disease and the dislocation was often followed by repair reactions. The origin of the disease, therefore, is to be ascribed to trauma. —*Donald C. Geist. M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Whiplash Injury of the Neck; Symptoms, Diagnosis, Treatment, and Prognosis. MURRAY M. BRAAF and SAMUEL ROSNER. *N. York State J. M.*, 1958, 58:1501.

IN THIS SERIES more than 1,000 cases were studied. The ages of the patients ranged from 6 to 65 years. The patients were observed from 1 to 10 years.

In whiplash injury of the neck the symptoms are usually immediate and marked. The prominent symptom is spasm of the cervical spinal muscles, but headache is by far the most common and annoying single symptom.

The symptoms referred to the upper extremity, if they occur, are pain and/or paresthesia. Sometimes there may be nausea, vomiting, anorexia, or diarrhea. Multiple symptoms may be referred to the eyes as well as to the ears, nose, and throat.

Dyspnea, paroxysmal hyperpnea, and palpitation are symptoms referred to the thorax. There may be a multitude of psychoneurotic symptoms. There may be many symptoms referable to the spinal cord. They may simulate many of the neurological diseases. Associated low back conditions are common and may run the entire list of symptomatology.

The physical findings show that there is ordinarily a spasm of the neck that may recur periodically.

The x-ray findings are important and there may or may not be a necessity for cervical myelography.

In the treatment cervical traction is by far the most satisfactory single help, although the application of warm, moist packs to the neck is useful.

The authors state that approximately 80 per cent of their patients were completely relieved of all neck and other referred symptoms. Ten per cent had recurrences within one year after cessation of the treatment. Cervical laminectomy was performed in 10 cases, and herniation or rupture of the nucleus pulposus was found in each case.

The authors were of the opinion that litigation plays no part in the severity or length of the symptoms.
—*Richard J. Bennett, Jr., M.D.*

Flexor-Tendon Injuries of the Fingers and Thumb; A Comparative Study. ALBERT VAN'T HOF and KINGSBURY G. HEIPLE. *J. Bone Surg.*, 1958, 40-A, 256.

SEVERAL large series of treated tendon injuries in the hand are presented. The purpose of the analysis is to ascertain preferable methods for repair of injuries of the flexor tendon, especially those in the "no man's land" of Bunnell or Boyes' "critical" zone. Graphic comparison of several large series indicates that the results of grafts within the flexor tunnel are distinctly better than those of primary repair. The relatively poor results of primary repair would seem to indicate that grafting procedures might be preferable in the treatment of injuries within the flexor tunnel. The results of primary repair outside the flexor tunnel and of the flexor pollicis longus are markedly better than those within the tunnel. The shorter period of disability following primary repair would seem to justify the continued handling of those injuries outside the flexor tunnel and of the thumb in this manner. Grafting remains available for the severely traumatized wound or to correct the poor result.

The surgical practice of the authors was usually immediate primary repair of tendons whenever possible. Secondary repair was performed only when the amount of associated trauma was too great to allow primary repair with any hope of success. Grafting procedures were reserved for those patients in whom a portion of the tendon was lost or in whom there were poor results after initial surgery.

The authors report 60 tendon repairs in 52 patients. Twenty-one of the repairs were in the thumb and 39 in the fingers of which 16 were in the flexor tunnel and 23 outside the tunnel. All procedures were primary repairs and there were no infections in the series. None of the injuries were more than 6 hours old at the time of repair. In all except 2 cases, the technique of the Bunnell pull-out wire was used when the injury was outside the flexor tunnel. Flexor digitorum sublimis tendons, when severed, were cut short and the fascial tunnel was incised or completely removed. Postoperatively the hands were splinted to relax the tendon. Pull-out wires were usually removed at the end of 3 weeks after which active motion was resumed. The results of the authors are compared to other series making a study of 310 cases in addition to those of the author for comparison.

Measurement of tendon function in the finger was recorded by observing the distance by which the finger tip lacked of touching the distal palmar crease. In the thumb, the range of active and passive flexion of the terminal phalanx was the criterion.

The authors' series of primary repairs included no patients who could touch the distal palmar crease with the tip of the finger. Thirty-eight per cent could come within one inch and 19 per cent between one

and one-half inch making 57 per cent that could come within one and one-half inch.

Factors observed by the authors which influenced the end result are the complicating injuries to joints and nerves and surrounding tissues which inevitably limit motion even where there may be perfect tendon function. The results of other series of primary repairs were comparable to those of the authors.

The results of these three series of primary repair of finger flexor tendon injuries outside of the flexor tunnel were as follows: 35 per cent could touch the palmar crease and 52 per cent fell between this and one inch making 87 per cent that came within one inch. A generally satisfactory outcome was the rule in this type of injury.

Considerable loss of flexion of the terminal joint of the thumb can be tolerated with little functional handicap to the patient. —*John Robert Close, M.D.*

Osteotomy of the Spine for Correction of Fixed Flexion Deformity. PAUL E. MCMASTER. *Arch. Surg.*, 1958, 76: 603.

FIVE CASES of osteotomy of the spine (4 surgical and 1 traumatic), with observations and comments referable to the indications, procedure, complications, and results, are reported. The need for continued postoperative observation and adequate support for at least a year following surgery to prevent the loss of correction is stressed.

The disease of ankylosing spondylitis (rheumatoid arthritis of the spine; Marie-Strümpell arthritis) necessitates different forms of treatment. In the early stage medical and irradiation therapy, plus the prevention of deformity, is indicated. The second phase, with flexion deformity, but in which there is not complete bony fusion of articular facets and longitudinal ligaments, may be corrected or controlled by hyperextension frames, casts, and braces. In the final stage of the disease, however, in which bony ankylosis exists with severe fixed flexion deformity of the spine, osteotomy is indicated. The operation offers the patient dramatic improvement not only in appearance but also in general well-being, and affords an important psychologic lift.

The main indication for surgery is a severe ankylosed flexion deformity of the spine that is not correctible by conservative measures, and with which the patient has difficulty in seeing ahead. Severe fixed flexion deformity of the hips, of either a fibrous or a bony nature, in addition to the spinal deformity, usually is a contraindication. The hip problem and possible correction thereof should be considered first. Other considerations for spinal surgery are improving the function of thoracic and abdominal structures, allowing the patient to return to a gainful occupation, and making him more acceptable in general society.

The optimum site of osteotomy is in the lumbar region for the thoracolumbar deformity. Ankylosis of costovertebral joints makes correction in the thoracic spine more difficult. Smith-Petersen and coworkers reported one case, but there was no objective improvement.

Careful surgery with control of bleeding facilitates the operation. The dura is apt to be thickened and adherent to the overlying ossified ligamentum flavum and may be punctured even with much care in stripping it away. The puncture itself is not too important except that the flow of spinal fluid into the wound creates an additional operative problem.

Following correction and closure a posterior plaster shell, which extends to the knees, is made and the next day an anterior shell is applied. The patient should be turned often to prevent pressure sores. One such complication occurred in this series, although it did not prove to be serious. Adams reported such a complication with development of a large anterior spinal abscess and death 10 weeks after osteotomy. Paralytic ileus is a frequent complication but with the usual measures can be well controlled.

The patient is placed in a body cast, extending to at least one knee, after 2 weeks. Bed rest is continued for a total of 2 months, followed by wearing of a back brace and gradual ambulation. Careful observation, both of the patient and of roentgenograms, is necessary to prevent loss of correction, which is apt to occur and did in one of the author's cases between 6 and 9 months after operation. Reasons for loss of correction are insufficient immobilization from a poor-fitting support, failure of the patient to wear his brace as prescribed or to return for follow-up observation.

It is estimated that at least one year is necessary for solid bony union which is sufficient to prevent loss of correction and during this time support should be worn. Caution against overcorrection at surgery has been mentioned in the literature, but this has not been encountered and no such case is known. In the event that this should occur at surgery, a gradual correction by attention to postoperative support would most probably control it.

—*C. Fred Goeringer, M.D.*

Experiences with the Ventral Extraperitoneal Fusion of Lumbar Vertebrae (Erfahrungen mit der ventralen extraperitonealen Wirbelverblockung). V. HENSELL. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 288: 209.

LANG described a fusion of the spinous processes in a case of tubercular spondylitis nearly 50 years ago. Since that time, Albee, Handley, Gibbs, and many others have modified this procedure, particularly in Britain and the United States. Spinal fusion has been recommended since 1943 in cases of scoliosis and derangement of the back caused by herniated intervertebral discs. Conventional spinal fusion has proved to be very satisfactory in tubercular spondylitis; however, in spondylolisthesis and similar conditions, pseudarthroses of the fused area very often occurred. In 1932 Burns successfully completed a transperitoneal fusion of the vertebral bodies by means of a bone graft taken from the tibia. Since that time this procedure has been improved and carried out in many parts of the world. Complications, consisting of ileus, thrombosis, and cauda equina paralysis have been numerous and have made this procedure very unpopular. Cloward places a bone graft in the intervertebral space after the intervertebral disc has been thoroughly removed.

The conventional type of spinal fusion was done in 10 patients, 3 of whom suffered from spondylolisthesis and 7 from severe back pain. Two of these patients

remained asymptomatic 9 years after operation. One patient had to have a second operation and a herniation of the intervertebral disc was found in spite of satisfactory fusion of the spinous processes and laminae. This experience and other similar ones led the author to attempt a fusion of the vertebral bodies by a direct anterior approach. The patient is placed in a supine position. A left pararectus incision is made, and the rectus fascia is opened. The muscle is retracted laterally to preserve its innervation. The peritoneal sac is dissected free from its posterior aspect until its vertebral bodies and the promontorium are visualized. The intervertebral disc is readily visualized in the vicinity of the bifurcation of the aorta. The intervertebral disc is curetted out, but not as thoroughly as usually advised in the American literature. A bone wedge, measuring about 3 centimeters, taken from the iliac crest, is driven into a prepared defect between the vertebrae to be fused. Particular attention is paid not to make that wedge too long in order to avoid compression of the cauda equina. The vena cava must be protected as well as the lumbar veins. In one case a branch of the lumboinguinal nerve was cut, causing a sensory loss over the anterior aspect of the right thigh, which was hardly noticed by the patient. A plaster jacket, which is removed at the end of 4 weeks, is applied after operation. In one case, a postoperative thrombosis of the lower extremity developed which cleared up, leaving no after effects.

This procedure was carried out on 23 patients. Eighteen patients were re-examined 2 to 6 years later. Nine were completely asymptomatic; 9 complained of vague pains in the lumbosacral region but admitted that they were much improved. The average age of the patients was 31 years. Cases with lumbosacral osteochondrosis (narrowing of the intervertebral disc between L^5 and S^1 with increased sclerosis of the subchondral plate) were included in this group that finally had to be operated upon. In rare instances myelography was used in the differential diagnosis of derangement of the lumbosacral area.

—George I. Reiss Jr., M.D.

Intertrochanteric Osteotomy in the Treatment of Arthroses of the Hip Joint (Intertrochantere Osteotomie in der Behandlung der Hueftgelenksarthrosen). A. GLAUBER and O. BARTA. *Zbl. Chir.*, 1958, 83:332.

IN ARTHRITIS DEFORMANS, the unevenness between the joint surfaces increases the work of the elastic tissues surrounding the joint with resulting muscular spasm which produces and increases the formation of flexion, adduction, and rotation contractures, and coincident displacement of the line of gravity. Correction of the contracture will restore stability and the normal line of gravity, thus eliminating difficulties and pain. Trochanteric osteotomies yielded relief in many cases but required fixation for months in a plaster cast, involving limitation of the movements of the knee joint for a more or less prolonged period. Efforts to overcome this disadvantage by the use of metal plates and nails in order to reduce the period of immobilization or to do away with the plaster cast altogether require special instruments, exert a strain on the patient, and involve a difficult operation with introduction of many foreign substances into the body.

The authors have sought to perfect a method that would yield results as good as those following trochanteric osteotomy, shorten the period of immobilization, and thus avoid the injurious effect on the knee joint.

In 4 of 12 patients treated since 1955, the authors performed the McMurray-Key osteotomy and in 8 patients the McMurray-Key osteotomy with the Glauber modification. Under ether narcosis an incision of 12 to 14 cm. is made parallel to the axis of the femur and distal to the tip of the trochanter. Following blunt dissection of the muscle fibers the periosteum is split and upon outward rotation of the hip, the lesser trochanter is exposed. Chiseling of the bone is then possible under control so that the incision begins a finger's breadth below the greater trochanter and ends in the upper third of the lesser trochanter or immediately below it forming an angle of 20 to 25 degrees. Because of contact of the spongiose surfaces, consolidation is rapid. The muscles inserted in the lesser trochanter are not divided, and the distal portion is displaced medially. Following suture a pelvic plaster cast combined with a Thomas splint is applied. In this way movements of the knee may be initiated early. The patient is permitted up after 4 weeks and the cast is removed after 10 weeks. Mobility of the knee joint is usually restored before the osteotomy has healed.

Control studies showed that mobility of the joint was equal to the preoperative status in at least half of the patients, while in the remainder it was even greater. By surgical correction of the contracture, muscle spasm is released with an accordingly increased mobility. Pain is also relieved by release of the contracture and revascularization with improved blood supply to the femoral head. It is stressed that too short a time has elapsed for final evaluation of this operation. The great advantage of the method is the possibility of restoring mobility of the knee joint even before consolidation of the osteotomy. Comparisons with arthroplasty and arthrodesis are permissible. In the former, treatment takes about a year and results are neither perfect nor lasting. Intertrochanteric osteotomy would also seem superior to arthrodesis. The joint does not need to be sacrificed and osteotomy is possible also in bilateral cases in addition to the advantage of its shorter healing period.

—Edith Schanche Moore

Ruptures of the Quadriceps Tendon; Study of 20 Tendon Ruptures. CARLO SCUDERI. *Am. J. Surg.*, 1958, 95: 626.

A STUDY was made of 18 patients with 20 ruptures of the quadriceps tendon. Two patients had bilateral ruptures. Three patients were not seen by a physician until some weeks after rupture developed: one patient, who also refused operation, was first seen by a physician 6 weeks after the tendon ruptured; another patient was first seen 7.5 weeks after a 60 per cent tear of the quadriceps tendon, but had good range of voluntary knee extension; a third patient was first seen 10 weeks after rupture and went elsewhere for surgical care.

Thirteen patients were operated on by the author. Follow-up periods ranged from 8 months to 2 years.

Eighteen of the ruptures were the result of indirect violence, and two of them were the result of direct cutting of the tendon by a sharp instrument. The author states that rupture of the quadriceps tendon may occur as a result of violent contracture of the quadriceps muscle, of extremely violent leverage action from acute flexion of the knee, or of degenerative changes of the tendon. The results of the operative treatment were excellent or good in 11 patients who underwent operation. The author used this classification when there was a complete return of extension with not more than 15 degrees loss of full flexion.

The author believes that in elderly obese people the predisposing cause of ruptured quadriceps tendon is degenerative change. In younger patients the major etiologic factor is usually direct violence or direct cutting of this tendon. Those people in whom the quadriceps tendon ruptures in middle life usually suffer such an injury as a consequence of direct violence with the knee in the semiflexed position at the time of rupture of the tendon.

The cardinal symptom in rupture of the quadriceps tendon is inability of voluntary extension of the knee, with the loss of active locomotion if the tear is complete. Pain is usually severe at the moment of tearing, but quickly subsides. The patella lies at a slightly lower level than normal, and palpation will reveal a defect in the quadriceps tendon with the knee extended. Roentgenograms are of no help, but should be used to rule out the presence of associated fracture.

The author states that the earlier a rupture of the quadriceps tendon is required, the better the end results and that rapid repair is worth while in order to forestall the presence of atrophy and fibrosis of the quadriceps muscle. With the exception of possible infection after operation, the outlook in cases of early treatment is excellent. It is the opinion of the author that surgical treatment is needed only in cases of complete rupture of the quadriceps tendon. In those patients in whom a partial tear is evidenced by local tenderness and formation of a hematoma but in whom maintenance of active muscular extension of the knee is demonstrated, conservative management is indicated by means of a cylindric cast employed for 5 to 6 weeks. All patients who have lost voluntary extension of the knee should have surgical attention. The author suggests repairing the tendon with interrupted sutures of doubled No. 00 chromic catgut reinforced with two Bunnell type pull-out wires of No. 28 stainless steel suture. A cylindric cast is used for 6 weeks postoperatively, and the Bunnell pull-out sutures are removed when the cast is removed. The author also suggests final reinforcement of the suture line with a triangular flap from the quadriceps tendon turned down over the point of repair.

—Einer W. Johnson, Jr., M.D.

The Results of Partial and Total Excision of the Patella. H. L. Duthie and J. R. Hutchinson. *J. Bone Surg.*, 1958, 40-B: 75.

Both good and bad results have been reported in total excision of the patella. Seventy-seven patients were re-examined. It was found that most patients do not recover full function of the knee until between 6 and 12 months after the operation. It was found that most patients with a poor result had ossification in the quadriceps tendon. There may be a direct relationship between discomfort in the knee and ossification in the quadriceps tendon.

It was thought that the greater incidence of arthritis of the femoral condyle in cases of fracture may have been partially due to the initial injury. It is suggested that when it is necessary to resuture the patellar ligament to the patella it should be done as near as possible to the articular surface.

It was found that among 13 patients in whom the patella was excised with a vertical split there was only one patient who could not extend the knee fully.

There is no evidence that arthritic changes in the femoral condyles are the end result of complete excision of the patella. *—Richard J. Bennett, Jr., M.D.*

Tendon Transplantation in the Foot After Poliomyelitis in Children. J. Mortens, P. Gregersen, and L. Zachariae. *Acta orthop. scand.*, 1957, 27: 153.

Early tendon transplantation in children whose feet have been paralyzed by poliomyelitis has been practiced in the Orthopedic Hospital in Copenhagen. One hundred and two feet have been treated. The average age of the patients was 6 years. The operation was seldom done on children under 4 to 5 years of age. It was done 2 years after the onset of the paralysis and follow-up examination was carried out a little after a year.

The established principles of reinforcement of weak antagonists and transplantation of the main deforming muscle were applied.

Results were classified as "good" when the deformity was reduced or abolished and function improved. They were "doubtful" if the deformity and function were unaltered, but further deformity was prevented. "Poor" results were those in which the deformity and function were unaltered and no preventive effect was secured.

The operation was successful in about one-half of the cases. It was almost universally so in the patients with "medial cavus" and "equinovarus." Less than half of the patients with calcaneus deformities and less than one-quarter of those with "planovalgus" had successful results. Limitations of the method were responsible for the largest number of doubtful and poor results, 34 among 102 cases, 20 of which were planovalgus. The series was too small to justify evaluation of the many methods of transplantation used.

The patients were divided into two groups in order to interpret the results. The groups were those with a weak calf and those with a strong calf. These have been further subdivided into those with invertor and those with evertor preponderance. At times, it was difficult to place each case in its correct group. Mortens and Pilcher have divided the balance of the foot into three systems: (1) dorsiflexion-plantar-flexion, (2) inversion-eversion, and (3) supination-pronation and elevation-depression of the first metatarsal. Pitfalls in designing the proper operation for the patient were avoided by considering the condition and its treatment with relation to these three systems.

The authors conclude that tendon transplantation is a useful method of restoring muscle balance and

reducing deformity in selected cases of partly paralyzed feet in children. —*Donald C. Geist, M.D.*

Surgical Management of Solid and Cystic Giant Cell Tumors (Die chirurgische Behandlung der soliden und cystischen Risenzellgeschwulst). H. HELLNER. *Chirurg*, 1958, 29: 149.

THE AUTHOR briefly reviews the clinical characteristics of giant cell tumor and expresses his extreme dissatisfaction with the mode of treatment involving curettage. Recurrences following this type of therapy are almost a certainty. Bone grafts to the resulting defect are soon resorbed. He believes that those instances in which curettage and bone graft have been reported as successful represent either mistakes in diagnosis or spontaneous regression. Resection of the lesion appears to be the best treatment for giant cell tumor. Such therapy presents difficult technical problems when the tumor is located in the lower femur or upper tibial epiphysis. The region surrounding the knee is also the most frequent site of giant cell tumors. The author recommends total resection of the tumor, with the joint, and reconstruction by intramedullary nailing.

If the lesion is inadequately treated when it is first seen, complications may develop which necessitate loss of the extremity. The danger of malignant degeneration is always present. The author believes that cystic changes in giant cell tumors represent a healing tendency of the lesion. In those cases in which he observed sarcomatous degeneration, the tumors were solid and had been previously treated inadequately either surgically or with x-ray therapy.

He furthermore deplores the use of the term "localized osteitis fibrosa" for both a juvenile bone cyst and a solitary giant cell tumor. Although the lesions may appear to be the same, a thorough study will reveal their true nature. —*J. C. Rosenberg, M.D.*

FRACTURES AND DISLOCATIONS

Treatment of Fractures with Rush Pins (Fraturbehandlung mit dem Rush-Federstab—Moeglichkeiten und Grenzen). L. KOSLOWSKI. *Chirurg*, 1958, 29: 108.

THE AUTHOR discusses internal fixation of fracture with Rush pins. In the past 18 months more than 80 patients with fractures have been treated with Rush pins in the author's clinic. Generally the pin is introduced through the smaller fragment closest to the joint. In many instances 2 pins are used for better fixation, one through each condyle. The introduction of the pin is easy since it is elastic and can mold itself in the available space in the cavity, this being of particular advantage in old fractures. The elastic resistance of pins against deforming factors was excellent and callus formation in all patients treated with this technique was good. In many cases the pins were introduced with a fluoroscopic control without exposure of fragments.

Complications have been very few when the technique which is recommended by Rush was followed. Care must be taken not to use short pins and to imbed the end of the pin in cortical bone, otherwise migration of the pin in the medullary cavity may occur. In fractures of the clavicle and oblique fractures of the lower tibia the use of Rush pins was not successful in the author's cases. After pinning, external immobilization of the extremity is essential for best results.

In conclusion the author recommends fixation of fractures with the Rush pin as a valuble method which is especially successful in fractures that are close to the joints. The article is illustrated and a number of roentgenograms are included.

—*George B. Wichman, M.D.*

The Treatment of Pseudarthrosis (Die Behandlung der Pseudarthrose). GERHARD KUNTSCHER. *Chir. Prax.*, 1958, p. 63.

THE AUTHOR'S METHOD of blind intramedullary nailing of pseudarthroses in long bones has definitely demonstrated that the old principles of treatment of pseudarthrosis have become obsolete. Resection, or freshening up of the pseudarthrosis site, is not only unnecessary but in many instances harmful. Even the Phemister method of onlay bone grafts has become obsolete.

The author uses a long drill which is hammered out of one piece of metal and is somewhat flexible. A small incision is made at one end of the long bone and, by means of the hand drill, a generous hole is bored in the proximal as well as distal fragment of the involved bone. Then, a large intramedullary nail is driven into the prepared hole. The area of the pseudarthrosis is not opened. In cases of angulation at the fracture site, a small incision is made over the pseudarthrosis site, and the two fragments are separated by means of a saw. The fragments are then held in a corrected position to allow the passage of the drill and finally the nail through its medullary cavity. The author presents reproductions of preoperative and postoperative roentgenograms of fractures of the tibia, the fibula, the humerus, and the radius. No cast is used postoperatively, and active motion is allowed as soon as possible. There were no failures.

—*George I. Reiss Jr., M.D.*

Evolution of Malunited Metaphysial Fractures of the Elbow in Children, in Relation to Growth (Le fratture metafisarie del gomito nei bambini consolidate in deformita, loro evoluzione in rapporto all'accrescimento). GIORGIO MONTICELLI. *Ortop. traumat. app. motore*, 1958, 26: 13.

THE AUTHOR has carefully studied the evolution of 400 supracondylar fractures of the humerus, including some perfectly reduced as well as nonunited fractures. A number of such fractures were re-examined when the subject had ceased to grow.

The author used a new roentgenographic projection to measure precisely the degree of angular deviation following a nonunited supracondylar fracture. These studies demonstrate that following a correct posttraumatic reduction, perfect anatomic and functional results are obtained with no growth disturbance. Lateral displacements of the bones without angulation will also eventually give good functional results. Axial displacements of the fragments, whether in the sagittal or the frontal plane, however, lead to permanent deformity of the elbow in the varus, or valgus, or hyperextension position, and to marked limitation of flexion and extension. Furthermore, growth disturbances ensuing as the development of

epiphysial nuclei may be abnormal and interference with the line of ossification may follow.

Angular fractures should therefore be reduced at the earliest possible moment, ideally at the time of injury. If seen at a subsequent time a corrective osteotomy should be performed forthwith.

—*Alfred Wiener, M.D.*

Fractures of the Forearm Treated with the Coaptor of Danis (Les fractures de l'avant-bras; traitement par le coapteur de Danis). P. DECOULX and J.-P. RAZEMON. *Ann. chir.*, 1958, 12: 397.

THE AUTHORS describe the results which they obtained with the so-called "Coaptor of Danis" in fractures of one or both bones of the forearm. The coaptor of Danis is a special plate enabling the surgeon to exert axial pressure on the fracture site by means of a small screw placed vertically at one end of the plate. A plaster cast is unnecessary after the correct use of this method. Movements are instituted immediately after healing of the soft tissues.

The authors treated 38 patients (in 12 cases both bones of the forearm, in 26 only the radius). Union occurred in 100 per cent of the cases. Most of the patients with fractures of both bones could return to their work between 3 and 6 months after treatment. When fractures of both bones have occurred, better results are obtained if both bones are fixed.

—*Joseph C. Mulier, M.D.*

Treatment of Malunited Colles' Fracture; A New Method with a Report on 40 Cases. B. MUKOPADHAYA. *Ind. J. Surg.*, 1958, 20: 95.

THE CARDINAL symptoms of malunited Colles' fracture are pain and tenderness over the ulnar aspect of the wrist, limitation of motion, particularly supination, weakness of grip, and there may be stiffness of the fingers with trophic changes. In cases in which conservative therapy, such as physical therapy and exercises, fails to improve the function of the wrist joints, an operation is contemplated, for which there are two main types of procedure.

1. Compensatory procedures. These operations are designed to improve the function of the joint without any attempt to restore the normal anatomy and mechanics of the wrist joint.

2. Reconstructive procedures are designed to restore the normal and anatomical relationships of the bones involved as much as possible.

The former group includes the Darrach operation (resection of portions of the ulna), the Milch cuff resection of the ulna, or simple osteotomy of the distal end of the radius. The second group includes Campbell's procedure in which portions of the ulna are removed and wedged between the osteotomized ends of the radius to restore the normal relationship of the bone. These procedures are not always successful, and the deformity very often recurs even while the arm is being immobilized with a plaster cast.

The author uses a procedure in which a wedge of bone is removed from the distal end of the radius with its base on the volar aspect of the bone. An incision is made on the medial side of the ulna between the tendons of the flexor and extensor carpi ulnaris. By subperiosteal dissection 2 to 3 inches of the ulna are exposed, and 1.5 inches of the bone is removed. In cases in which the styloid process is fractured and separated from the main portion of the ulna, it is left in situ. In cases in which no fracture of the styloid process exists, it is removed with the main fragment of the bone. In children with persistent epiphysial plate, resection is terminated 1 inch proximal to the level of the epiphysis. Portions of the pronator quadratus are left intact. After separation of the insertion of the pronator quadratus, the radius is approached through the same incision. A wedge osteotomy is done at the lower end of the radius. This restores the normal relationship of the distal end of the radius to its shaft by closing the gap of the osteotomy. The pronator quadratus muscle is reattached to its point of insertion by interrupted sutures. The ulnar collateral ligament and its attachment to the periosteum of the ulna is carefully repaired, which allows firm attachment between the structure and the carpal bones. A cast is applied with the wrist in neutral position and mild volar flexion. The cast is removed at the end of 4 weeks and physical therapy treatment is started. Several pictures and reproductions of preoperative and postoperative roentgenograms are presented.

The author's report is based on a study of 134 patients with malunited Colles' fracture of which 44 were submitted to operative treatment. The functional end results have been assessed on a point system described by Gartland and Werby. On the basis of this system, 29 results were judged as excellent and 8 as fair. In no case was there any need for arthrodesis following the operation.

—*George I. Reiss Jr., M.D.*

Volar Luxation of the Carpal Lunate Bone Associated with Phlegmon of the Tendon Sheaths of the Hand (Reine Lunatumluxation nach volar bei gleichzeitiger Sehnenscheidenphlegmone). G. HARTMANN. *Zbl. Chir.*, 1958, 83: 163.

IN THE LITERATURE the most frequently observed dislocation of the carpal lunate occurred dorsally. According to Perschl, of 86 cases with traumatic dislocation of the carpal lunate 41 per cent occurred dorsally which resulted in tear of the capitate-lunate ligaments while the radial-lunate ligaments remained intact. In 51 per cent of the cases the dorsal radial-lunate ligament was torn and volar displacement of the carpal-lunate occurred. Tears of both the volar and dorsal radial-lunate ligaments, which resulted in volar displacement of the lunate bone, occurred in only 2 of 86 cases. Because of the rarity of this type of dislocation the following case is reported by the author.

A 57 year old farmer was seen in the clinic in November, 1956 with a phlegmon of the tendon sheaths of the right hand and forearm which developed from an old infection of the fifth finger. Three days prior to the visit to the clinic the patient fell on his right hand. When seen in the clinic, he complained of pain, swelling of the entire hand, and an inability to move the fingers. Examination revealed a point of tenderness over the fifth metacarpal bone, which was especially pronounced in the volar aspect of the carpus. There was also a hard, round swelling in the volar aspect which was quite tender. The skin over the swelling appeared to be inflamed. Anteroposterior and

lateral roentgenograms were made and interpreted as normal.

Since inflammation persisted, the tendon sheaths were opened by multiple incisions and pus was evacuated and cultured. The hand was immobilized in a cast. After the signs of inflammation regressed, the patient continued to complain of pain in the hand and signs of paresis of the median nerve appeared. A prominence was found on the volar aspect of the hand. Roentgenograms were made and at this stage revealed the presence of volar dislocation of the carpal navicular bone. Since closed reduction was not successful extirpation of the lunate bone was performed. At operation a complete tear of both the volar and dorsal radiolunate ligaments was found with the lunate-capitate ligaments intact. The convex or the articular surface of the lunate bone was pointing toward the vola. The author suggests that an incomplete tear of both ligaments may have occurred during the accident and that infection was responsible for the completion of destruction and the occurrence of subluxation which was noted on subsequent roentgenograms.

Several illustrations demonstrating the mechanism of various subluxations of the carpal lunate bone, including the first and second roentgenograms of the patient's hand, are included in the article.

—George B. Wichman, M.D.

Attempts to Restore the Function of Prehension of the Thumb (Tentatives de restauration des fonctions de préhension du pouce). J. MICHON. *Sem. hôp. Paris, Ann. chir. plast.*, 1958, 3: 1.

A STUDY is presented of some posttraumatic lesions of the hand affecting the function of prehension with emphasis on certain surgical problems, the means suggested for their solution, and the results obtained. In 2 cases loss of prehension was attributable to amputation of all fingers except the thumb; in the first case the fingers were cut off by a saw and in the second were crushed in a mortar. In the first case the wound healed after ulceration of the grafts. Two prostheses afforded, in addition to an opposing surface for the slightly movable thumb and useful force attained by analytical re-education, also the power to write by attaching a pen to the finger. This patient was thus able to resume his occupation as supervisor in a stockyard. In the second case, the wound closed by primary intention following repair with a hypothenar flap and a free graft. The first attempt to apply a prosthesis failed because of sensitivity of the cicatricial area which was then excised together with a large plexiform neuroma and covered with an abdominal flap. Since no progress in tolerance for the prosthesis was attained, an amputation of the lower third of the forearm was performed at the patient's request. Pains in the stump 18 months thereafter required unsheathing of the median and cubital nerves according to Dieckmann's method and the patient could then tolerate a simple prosthesis.

In attempting to place a rigid thumb in a favorable position, the functional state of the opposable fingers is a determining factor. If they are intact, a thumb blocked in strong abduction and opposition is very useful, permitting a powerful grasp and a perfect hold. For instance, in the case of a welder whose right thumb had been caught in a grinder, reparative procedures were interrupted by necrosis, and articular suppuration resulted eventually in a short thumb, rigid except for slight carpometacarpal movements. Its position was in opposition in relation to the medius and in sufficient abduction not to interfere with flexion of the fingers. Strong prehension was possible and a useful grasp with the index and middle fingers so that he could resume his work as a welder 5 months after the accident. When the mobility of the other fingers is reduced, arthrodesis of the thumb has less functional value but may prove useful.

In one patient suffering almost total paralysis of the fingers following a serious electrical burn accident, with severe articular rigidity and extensive trophic disturbances, a graft was used to repair the thumb and index finger in the hope of eventually restoring the grasp. Although the graft was not wholly successful, the patient was able to unbutton his own vest. In the other thumb an attempt was made to re-establish adduction since abduction, although limited, was good with regard to force. The extensor tendon of the third finger was reflected and inserted in two tongues on the head of the first metacarpal and base of the phalanx of the thumb at the internal surface. This procedure gave excellent results, excepting a tendency of the thumb to be drawn into dorsal hyperextension so that a palmar tendon would be required to improve its contact with the radial margin of the hand. Making use of the elementary movements of the two thumbs, the patient learned to dress, feed himself, and write, and he resumed his occupation as an industrial designer.

The inefficiency of the tendon grafts and of the intermetacarpal graft, and the unforeseen utility of a simple transplantation undertaken in despair, emphasized the value of careful observation of the facts and the failure of too ambitious projects. Under similar circumstances, the author now attempts plastic reconstruction of the skin, followed by nerve grafts and finally tendon grafts when there seems to be a reasonable chance of success. Sequelae of local cicatricial origin frequently permit restoration of prehension power without sacrifice or with restoration of mobility of the thumb and fingers. Two cases are described, illustrating the fact that it is possible to carry excision or disinsertion of the muscles of the commissure of the thumb quite far and still conserve correct function through persistence of some fasciculi. Thus for restoration of prehension the authors suggest three methods, namely: (1) prosthesis opposed to an isolated thumb, (2) palliative methods, such as arthrodeses of opposition or transplantations, and (3) plastic surgery and reconstruction. The anatomical and functional state of each of these elements in opposition to the thumb must be considered in the light of functional synthesis and not separately. The profession or social status of the patient as well as psychological factors have to be considered. Only experience and untiring attention can help in the choice of procedure. The authors greatly prefer exact anatomic functional reconstruction but only when it remains within reasonable limits.

—Edith Schanche Moore

Open Versus Closed Methods in Treating Fractures of the Leg. PRESTON A. WADE and ROLLA D. CAMPBELL, JR. *Am. J. Surg.*, 1958, 95: 599.

THE AUTHORS have reviewed 165 cases of fracture of the tibial shaft from the combined fracture service of the New York Hospital and the Hospital for Special Surgery. Another group of 111 fractures of civilian type injuries (non-missile) from Valley Forge Army Hospital is presented.

Fractures of the tibia in children are discussed as a separate group. There were 38 of these and all healed well in 10 weeks or less. None needed open reduction or internal fixation; treatment with a cast sufficed for all. The methods of injury, the number of varying architectural types, and the number of cases in each age group are described briefly.

One hundred twenty-seven fractures in adults are next analyzed according to the method of treatment.

Screw fixation was used for 25 simple and 7 compound fractures. The levels of these fractures varied; 19 occurred between the middle and lower thirds in the group of simple fractures. Screws were applied from 3 hours to 8 weeks after fracture. The average healing time varied from 4 months to 4.5 months whether bone chips were used, whether the fracture was simple or compound, and whether the fibula was fractured or not. Complications included one delayed union, one nonunion after an infection in the simple group. There was one infection among the seven compound fractures treated by screw fixation. The authors point out that the screws must be placed at right angles to the shaft of the tibia and not to the fracture site and that a tight-fitting cast must be applied before upright posture on crutches is allowed.

Plates were used in 21 cases, 11 simple and 10 compound fractures. Union occurred in 12 cases in 4.6 months; 9 were simple and 3 compound. Bone grafts used in 3 cases did not speed healing. There were 8 nonunions (4 with infection) and 1 delayed union. In 7 compound fractures which were plated and in which nonunion developed, there were 3 infections, 1 resulting in amputation. It was strongly felt by the authors that the plates contributed to nonunion by preventing coaptation of the fracture ends and aiding infection by an overwhelming insult to the local tissues.

Intramedullary nails were used in 19 cases: Lottes' nails in 16, nested U nails in 2, and two Rush nails in 1. Four compound fractures healed in an average time of 4.1 months and 16 simple fractures healed in 5.3 months. In 5 cases in which grafts were used, healing time was cut to an average of 3.5 months. Nails worked well in segmental fractures where there was no comminution at the fracture ends of the upper and lower fragments. Blind nailings work well in single fractures but are difficult in segmental fractures. Fractures at either end of the bone are not suitable for nailing because of the lack of cortical apposition to the nail.

Parham bands were used in 4 closed fractures. One patient who had the bands removed routinely at 3 months went on to have nonunion. All the other fractures healed in an average of 3.7 months. All fractures were oblique or with a large butterfly fragment.

Traction with an os calcis pin and a later cast was used in 17 cases, 8 simple and 9 compound. There was one nonunion and one infection in a compound case. Supervision must be strict and this method is not adaptable for mentally disturbed patients. Initially, a good number of traction cases had to be opened for better apposition of fragments.

Casts alone were used in 34 cases, 21 simple fractures and 13 compound. The average healing time was 3.6 months for simple fractures and 6 months for compound. In those with an intact fibula the healing averaged 3 months. There was 1 nonunion at 2 years in an infected compound fracture.

The series of 111 cases from Valley Forge Army Hospital was evaluated. Of the simple fractures, one third were treated closed and had a healing time of 7.7 months and two-thirds were treated by open reduction and had an average healing time of 9 months. (Different criteria for healing time were used in the two series). There were 2 nonunions in each of the open and the closed groups. In the group of compound fractures, one-half were treated without internal fixation with an average healing time of 11.3 months; there were 4 nonunions but these had extensive full thickness skin defects initially. The other half with internal fixation had an average healing time of 11.5 months and there were 3 nonunions. Fractures with the fibula intact had an average healing time of 5.3 months as compared to 8.1 months for those with a fractured fibula.

Comparison of both series is made. The least complications occurred in simple fractures that were treated by casts alone. Healing was quicker with screws and bands in the New York series and with Lottes' nails in the Army series.

The slowest healing occurred with plates in the Army group whereas traction was the slowest in the New York group. Plates gave the poorest over-all results: 47 per cent nonunion in compound fractures.

Lottes' nails resulted in prompt healing in indicated cases and were well tolerated in compound cases.

—Richard G. Saxon, M.D.

Fractures of the Os Calcis. W. R. N. LINDSAY and F. P. DEWAR. *Am. J. Surg.*, 1958, 95: 555.

AN EVALUATION of 147 patients with fracture of the os calcis of whom 74 per cent were traced 6 years or longer is presented. All had involvement of the subastragaloid joint. A very thorough assessment of each case was made including x-rays of both the normal and the injured foot. The history was particularly meticulous in regard to residual symptoms. Pain was investigated in relation to daily activity, site, time during the day, severity, character, weather, and work performed before and after injury. Inquiry was made as to the ability to walk a mile and recreational activities before and after injury. In addition to other physical findings, such as calluses, peripheral pulse, varicosities, swelling, heel thickening, measurement of calf and ankle, limp, clawing of the toes, peroneal spasm, and hallux rigidus, the ability to walk on the toes was particularly noted.

The authors found it was not possible to classify the fractures from the available roentgenograms. Since the subastragaloid joint was always involved the cases were divided into three groups: (a) moderate degree of deformity, (b) severe degree of deformity, and (c)

fractures involving the subastragaloid joint without displacement. The main fracture plane runs forward and laterally from a point behind the sustentaculum tali through, behind, or forward of the posterior articular facet. The secondary plane runs through the posterior articular facet or includes all of it. The articular surface may be connected to the upper portion of the bone or it may be compressed like a free fragment.

Historically there are five main methods of treatment: (1) elevation and bandaging, (2) traction, (3) open reduction, (4) hammering (disimpaction) followed by manual molding, and (5) subastragaloid fusion. Fusion has been done early or late to relieve pain from a damaged subastragaloid joint and the authors believe its use is open to question.

The natural history of these fractures gleaned from the records is presented. A tremendous force is necessary to produce a fractured os calcis: the average height fallen was 17.3 feet and *all* patients fell on a *hard surface*. Surprisingly, the average age was 44.6 years; the results did not vary with age in relation to the type of treatment. Many patients were not included because they had associated injuries. In the acute stage there is marked swelling and pain which gradually subsides until weight-bearing is commenced. There follows a period of months or years of constant pain which very slowly diminishes until a plateau is reached. This plateau was reached on an average in 16.6 months in non-manipulative cases, 17.2 months in manipulation or traction cases, and in 19.5 months in surgical arthrodesis cases. After 10 years a few patients had continued improvement; a few had worse pain and there were 7 patients who had a flare-up of pain years after the injury, which varied considerably in etiology and time. Toe walking was a good test of the end result as patients with good results could do it. It appeared that the inability to walk on the toes was related to pain and not to relative shortening of the Achilles tendon. Limp was more prevalent in the patients who had had manipulative therapy or operation and was related to stiffness. Most cases had calf atrophy but not all were necessarily weakened. About 40 per cent of the patients complained of pain with weather change. Edema was usually associated with the severity of pain. The ability to return to heavy work seemed greater in the conservatively treated group. These patients returned to work in half the time that the group who had surgical arthrodesis did.

The end results of treatment were assessed according to: (a) ability to perform heavy work, (b) ability to walk a mile, and (c) effect of the injury on the patient's personal life, such as participation in sports, or change of job, awareness of pain, and constant treatment for relief of pain. Of the 147 patients some had bilateral fractures and these were evaluated separately; the total number of fractures considered was 153. The functional result was related to treatment and to type of fracture, whether it was severe or moderate. Eighty-three patients were treated conservatively; 63 (76 per cent) had good results. Arthrodesis was performed on 50 patients and 30 (60 per cent) had good results while 20 (40 per cent) had poor results. The cases were further divided into severe and moderate deformity in each therapy group. Of those with severe fractures 71 per cent had a good result with conservative therapy while 49 per cent had such a result with arthrodesis. Of the moderate deformity group 83 per cent had a good result with conservative therapy while 87 per cent had a good result with arthrodesis. Dividing the conservative therapy group into non-manipulative and manipulative methods, the results were good in 81 per cent without manipulation and 72 per cent with manipulation. Not included in this series were 20 patients who had a late arthrodesis. Seventy per cent had a poor end result. The authors cite one case in which the os calcis was removed entirely and the patient returned to very heavy labor.

A meticulous assessment of the pain factor is presented since the end result is largely determined by this factor. There were five types of pain noted: (1) pain during daily activity, (2) pain after work while resting and on resuming activity, (3) immediate pain on weight bearing, (4) pain when walking on an uneven surface, and (5) a severe nocturnal "bursting, burning" pain. Pain occurred in the heel, lateral malleolus, and below the medial malleolus. The pain below the lateral malleolus was most common and 36 per cent of those patients with a solid subastragaloid fusion complained of this pain as well as 42 per cent of those treated conservatively. This pain also does not correlate with impingement of the lateral malleolus with the os calcis. There was no correlation between the type of treatment and the site of pain.

There were 27 patients who had no pain whatsoever. Only one-third of these patients had severe deformity as compared to two-thirds in the entire series. These patients were mobilized earlier but had all types of treatment with varying degrees of motion in the subastragaloid joint. The authors could find no correlation in the series between motion, fibrous subastragaloid arthrodesis or bony arthrodesis, and pain. They strongly suggest that the subastragaloid joint deformity is not the sole cause of pain in this injury and surgical arthrodesis is not its cure.

Pain in the ankle joint could not be correlated with radiologic evidence of osteoarthritis in this joint. There was an increased lateral rocking of the ankle joint in cases with arthrodesis. In 45 of 153 cases the ankle could not be dorsiflexed beyond 90 degrees.

Arthritis in the taloscaphoid and calcaneocuboid joints could not be correlated with pain.

Peroneal spasm was not a common finding and could not be correlated with subastragaloid arthritis. There were 12 cases with subluxation of the peroneal tendons due to thickening of the os calcis.

Other disabilities such as claw toes, callosities, hallux rigidus, and stiffness caused forefoot pain. Forefoot pain was never a main factor in determining a poor result. —*Richard G. Saxon, M.D.*

ORTHOPEDICS IN GENERAL

A Histochemical Study of Transplanted Skeletal Tissue During Tissue Culture "In Vivo". ROBERT B. DUTHIE. *Brit. J. Plast. Surg.*, 1958, 11: 1.

THIS DETAILED and extensive study of transplanted skeletal tissue was carried out in large groups of white

albino rats by transplanting fracture callus, periosteum, very early fracture callus and cortical bone into the thighs of rats at the site of the fractured bone, into the hamstring muscles and over exposed bone. The transplanted tissue was contained in diffusion chambers made of "sellotape", in which two windows, 4 mm. in diameter, had been made with a cork borer and the openings closed with "millipore" filters, discs of cellulose esters. These chambers permitted physical separation from the host but permitted passage of body fluids through the filters.

At different intervals in the different groups the rats received intraperitoneal injections of S^{35} to permit securing autoradiographs.

The very comprehensive and detailed description of the author's findings, illustrated with numerous photomicrographs, deserves careful study by everyone interested in the problem of transplantation of bone and cartilage. Two paragraphs from the author's conclusions and discussion are quoted verbatim:

"In the first three series which consisted of transplants of groups of osteogenic cells, tissue removed from fracture callus seven days old exhibited the highest degree of cellular differentiation to form cartilage which was then calcified. This was due to the differentiation of the cells having continued for a considerable period before their transplantation, and not to . . . . . the particular histological structure of the implant.

". . . the common reaction of the host tissues was to form around the implanted chamber a shell of vascular fibroblastic tissue containing small blood-vessels as well as newly formed primitive blood-vessels, but because of the membranes no continuous vascular pathway was present. Even so, nutrition of the differentiating cells was adequate for organized growth and in many instances for subsequent calcification. Because ions of S^{35} passed through the membranes to label the sulphated mucopolysaccharide complex, chondroitin-sulphuric acid, during the process of chondrogenesis, it is suggested that there was a pathway for nutritional substances as well as for calcium and phosphate ions."

With reference to the cortical bone series:

"It is suggested that because the cells in the haversian system survived for at least seven days, an important matter for continuance of their existence and function is the speed of vascularization by the host tissues. If this takes place quickly enough, the cortical transplant or graft will survive as an organized tissue, but if the process is delayed, the graft will act only as a framework which is sooner or later replaced by the tissues of the host. The process of vascularization is likely to take place more quickly in autogenous than in homogenous bone grafts.

"When transferred, cortical bone is rarely uniform in composition and usually contains myelogenous cells on one side and periosteum on the other. In the present study both these cellular structures have been shown to possess functional activity up to seven days and also to withstand ischemia resulting from transplantation. From them new bone formation can result directly but, more importantly, it is probable that they secrete a specific inducting substance and also provide the continuous physicochemical pathway which is believed to be necessary for differentiation by induction of the invading host cells."

—*Samuel L. Governale, M.D.*

Petals Versus Bony Transplants in Experimental Pseudarthrosis. Leo Jarry and Hans K. Uhthoff. *Rev. canad. biol.*, 1958, 17: 75.

Pseudarthrosis can be described clinically as well as pathologicoanatomically as a condition in which posttraumatic osteogenesis has ceased before solid osseous union of the fragments has taken place. In view of these facts all techniques aim at restimulation of the osteogenesis. The authors investigated the osteogenic effect of "petals" in the treatment of pseudarthrosis. In the experiments 156 adult white rats (age about 15 months and weighing about 350 gm.) were used. The remaining 69 rats were satisfactory for accurate evaluation. Each of these rats underwent three operations: (1) creation of a pseudarthrosis; (2) treatment of the pseudarthrosis; and (3) removal of the immobilization in order to determine the influence of weight bearing.

It is very difficult to produce experimental pseudarthroses in the adult rat. Persistent results can be obtained only with a method called "combined interposition" (metal disc plus soft tissue). It is possible that pseudarthrosis develops into nearthrosis after 160 days; it does not heal once the primary osteogenic activity is exhausted. An effective method of treating pseudarthrosis without resorting to transplants has been suggested. By means of roentgenography, weight bearing, and stability tests it has been established that the density and the stability of the union is more pronounced on the petal side as compared with the transplant side. Although the time of healing does not seem to be shortened, it nevertheless remains a fact that the chances of healing when employing the petal technique are as good as, if not better than, those offered by a transplant even if the latter is used under ideal conditions (fresh autogenous transplant with the periosteum left in place and better immobilization by the prevention of rotation of the fragments).

Stability and weight-bearing tests, x-ray examinations, and histological studies reveal better results on the petal side. —*C. Fred Goeringer, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Chronic Aortoiliac Thrombosis; A Review of 65 Cases. RICHARD BECKWITH, ELSTON R. HUFFMAN, B. EISEMAN, and S. GILBERT BLOUNT, JR. *N. England J. M.*, 1958, 258: 721.

SIXTY-FIVE CASES of chronic aortoiliac thrombosis were encountered in the 6 year period from 1951 to 1956 inclusive. Cases were included in this study only if the diagnosis was confirmed by translumbar aortography, autopsy, or operation. X-ray examination of the chest and electrocardiographic studies were obtained routinely and renal function was evaluated in all patients. Follow-up studies varied from less than 1 year to 6 years.

Pain on walking occurred in the leg and hip area in 54 of 65 patients (83 per cent). As with the degree of claudication, the degree of trophic change appears to be largely a function of the degree of occlusion and the adequacy of collateral circulation. The development of marked atrophic changes consistently appeared to precede the gradual development of gangrene.

The classic finding in this disease concerns the diminution or absence of palpable pulsations in the arteries of the lower extremities. On the basis of aortography or gross pathologic examination, or both, atherosclerotic involvement confined to a short segment of artery was not encountered in this study. That atherosclerosis is a generalized disease has previously been emphasized. In the present study particular attention was paid to evaluating the entire cardiovascular system. In this group of 65 patients with chronic aortoiliac thrombosis the high prevalence of significant vascular disease elsewhere proved to be a conspicuous feature. Vascular hypertension was encountered in 49 per cent. Cerebrovascular disease occurred in 21 per cent. Renal disease was observed in 51 per cent.

A clinical diagnosis of significant heart disease was made in 75 per cent. Significant cardiac, renal, hypertensive, or cerebrovascular disease was found to be present in 56 of 65 cases of chronic aortoiliac thrombosis, or 86 per cent.

From the foregoing considerations it is readily apparent that chronic aortoiliac thrombosis is but one manifestation of a generalized process of atherosclerosis. During the 6 year period encompassed by this study, 22 of the 65 patients died while under observation. Deaths attributable directly to aortoiliac thrombosis were rare. Death in patients with aortoiliac thrombosis was usually due to disease of the coronary, renal, or cerebral arteries. In the present series 8 carefully selected patients underwent successful resection and homograft replacement. Thus, the ideal and reasonably rare candidate for direct surgical intervention for chronic aortoiliac thrombosis is one with minimal atherosclerotic involvement of the remainder of the cardiovascular system.

—Robert A. Nabatoff, M.D.

Late Results of Direct Surgery of the Aortic Bifurcation and Its Major Branches. F. B. COCKETT and A. G. NORMAN. *Brit. M. J.*, 1958, 1:727.

SINCE FAIRLY LARGE NUMBERS of aortic replacements by homografts and plastic prostheses have been reported in recent years, it was deemed advisable to present a careful follow-up of a group of 30 patients in whom reconstruction or replacement of the aortic bifurcation or one of its major branches was carried out, and to give the authors' experiences with the technique, the management of these cases, and the operative indications.

There were 26 patients with thrombotic disease and 4 with aortic aneurysm, of whom 18 (aged 45 to 65 years) were treated by resection and homograft replacement or by-pass, and 12 with plastic prostheses or endarterectomy. There were 2 deaths in the homograft group, one most likely from a blow-out at the suture line and the other from massive pulmonary infarction and renal failure. The complications included paralytic ileus, closure of the graft with loss of the leg, staphylococcal enteritis with subsequent leakage at an iliac anastomosis and resultant amputation, and loss of the "good leg" because of embolization into the popliteal artery. End-to-side large lumen anastomoses are preferred, especially in the smaller arteries, because the end-to-end type tend to become occluded; occlusion occurred in 2 of 10 cases, while all end-to-side anastomoses were patent from 1 to 3 years.

Of this group of 18 patients, 2 died early in the postoperative period, 3 lost a limb, and 2 developed occlusions of the graft. The remaining patients are well and would have been faced with disablement on account of their disease if they had not undergone the surgical procedure.

Of the second series of 6 patients with plastic replacements, 4 had aortic aneurysms, and 2 thrombotic disease. In the latter, the plastics were not satisfactory, and polyvinyl sponge (ivalon) did not function well even in the cases of aneurysm. In the third group of 6 patients treated by thromboendarterectomy ("reboring") there were no deaths and no major complications, and although one vessel was rethrombosed, the limb was saved.

The authors discuss the problem of patients with both high and low arterial occlusions, that is, in the aorta or the iliac arteries above and in the femoral or popliteal arteries below. They have saved limbs and relieved severe ischemic symptoms by eliminating the proximal block and not attacking the distal blocks at all. In general, they prefer end-to-side anastomoses, and do endarterectomies whenever feasible, especially in short occlusions of the larger arteries. They use plastic prostheses in aneurysms only and prefer orlon to ivalon. The hospital mortality in this series was 7 per cent with another 7 per cent due directly or indirectly to the operation after the patient had been discharged from the hospital.

—Albert M. Schwartz, M.D.

Periarteritis Nodosa and Temporal Arteritis. RICHARD M. SHICK. *Minnesota M.*, 1958, 41:231.

PERIARTERITIS nodosa is a disseminated disease of unknown origin, characterized by focal inflammatory lesions which involve chiefly medium-sized and small arteries and arterioles. It has been classified as a so-called collagen disease, and as such takes its place with other rheumatic and "pararheumatic" syndromes such as inflammatory and degenerative disease of the connective tissue system. A majority of the patients are between the ages of 20 and 40 years.

The present opinion is that multiple etiologic factors may be involved in the production of the disease, with a sensitivity reaction to either drugs or infectious processes playing a prominent role.

The symptoms and signs are protean. They may vary from time to time and this variation may produce a most confusing clinical picture. The disease should be suspected in a patient who has an obscure type of illness characterized by fever and progressive decline of his general health, with symptoms and signs of a diffuse systemic process and involvement of several organs and tissues, particularly the kidneys, gastrointestinal tract, and peripheral nerves. The presence of a rapid sedimentation rate, leucocytosis with or without eosinophilia, asthma, and hypertension, and failure of the condition to respond to conventional treatment make the diagnosis even more likely. In the final analysis, however, a definite diagnosis can be established only by histologic examination. A positive result of biopsy is the best diagnostic evidence of the disease, but a negative result does not exclude the diagnosis.

The author administered cortisone or related steroids to approximately 50 patients with periarteritis nodosa. Follow-up data have been obtained in 30 cases in which cortisone or corticotropin was used. Clinical diagnoses were confirmed by biopsy in all of the cases. Doses of each hormone were initiated at fairly high levels, and were regulated according to the patient's response. The clinical impression was that the results are more favorable and the incidence of relapses after cessation of therapy was lower when the intramuscular route was employed than when the oral route was used. Additional measures included the restriction of sodium in the diet and the administration of potassium chloride to patients with adequate renal function. Some patients required more than one course of treatment, and in a few instances it was necessary to continue suppressive therapy with orally administered cortisone.

Despite initial improvement, 6 patients died shortly after treatment was instituted or soon after administration of the hormones was discontinued. The disease of the remaining 21 patients appeared to be either in remission or adequately suppressed when they were last observed after intervals ranging from 1 year to 5 years after the initial course of treatment. However, in most instances, evidence of some residual vascular damage had persisted.

It appears that cortisone and corticotropin can induce clinical remissions in, or suppress the activity of periarteritis nodosa in some cases, and that they may alter effectively the primary pathologic process. Treatment should be instituted early, before widespread vascular damage has occurred, and should be intensive and prolonged. The suppressive effects of prednisone and prednisolone appear to be comparable to those of cortisone administered by the oral route.

Temporal (cranial) arteritis is a clinical and pathologic entity that occurs in elderly persons. It is characterized by symptoms and signs referable to inflammation of the temporal arteries, by constitutional effects suggestive of a low-grade subacute or chronic infectious process, and by histologic evidence of a granulomatous arteritis of the affected vessels. Its cause is unknown.

Localized tenderness and induration are felt along the course of the temporal arteries. An elderly patient who has transitory amblyopia or sudden loss of vision should be carefully examined for tender, indurated, or pulseless temporal or occipital arteries, and the symptoms should be reviewed from the standpoint of possible temporal arteritis. A rapid sedimentation rate is present invariably during the active phase of the disease. When the diagnosis is doubtful, it may be confirmed by biopsy of what appears to be an involved vessel.

Generally, the disease runs a self-limited course, lasting from 2 to 30 months, with an average duration of about 6 months. The active and symptomatic phase gradually subsides, although occlusion of the involved arteries may persist. Relapses may occur but are uncommon.

Excision of a portion of the involved segment of the artery generally relieves the pain of local origin, but seldom, if ever, has any effect on the general manifestations or the course of the disease. Roentgen-ray irradiation of the affected arteries and the periarterial injection of procaine hydrochloride, likewise, may relieve local distress.

To evaluate the effect of steroid therapy, cases in which the diagnosis was proved by biopsy were recently reviewed. In general, the dose schedules were essentially the same as for patients with periarteritis nodosa. There appears to be little advantage in the parenteral over the oral route of administration of cortisone in this disease. In some instances, it was necessary to continue suppressive treatment with orally administered cortisone in doses of 25 to 75 mgm. daily until the disease had completed its natural course.

Since the author believes that in respects other than ocular, temporal arteritis is primarily a self-limited and benign condition, prevention and treatment of the associated visual loss are of paramount importance. All but a very few patients in this series were promptly relieved of their other symptoms by the administration of adrenal corticosteroid.

Thirty-one (56 per cent) of the 55 patients, at the time of admission to the clinic, had ocular involvement which was considered to be part of the syndrome of temporal arteritis. Twenty patients (36 per cent of the group) had some loss of vision at the time of admission, and one patient had transient amblyopia after the institution of hormonal therapy. Of this group of 20 patients, 6 had unilateral blindness and 5 had bilateral blindness. The condition of the blind eyes did not improve under treatment in any of the cases. However, bilateral blindness did not develop

in any patient during treatment. The percentage of occurrence of bilateral blindness increased from 6 on admission to 17 at the time of discharge in a previous group of 53 patients with temporal arteritis seen at the clinic prior to the introduction of steroid therapy.

Total blindness and long-standing partial loss of vision are unlikely to abate with any type of treatment. When loss of vision is partial and of recent onset, some restoration of vision may occur, with or without treatment.

The author thinks that the combined use of anticoagulants and adrenal corticosteroids might be indicated and might be of value in certain instances, notably for patients who have had recent impairment or loss of vision in one eye. Intermittent inhalation of 100 per cent oxygen has seemed to be of some benefit in cases of acute or recent visual impairment, but the author has not been impressed with the value of vasodilating drugs or stellate-ganglion blocks in such cases.

The chief value of adrenal corticosteroids in the treatment of temporal arteritis is to suppress the arteritis as long as it endures, and thus to safeguard the degree of vision which remains.

Noradrenaline in Artery Walls and Its Dispersal by Reserpine. J. H. BURN and M. J. RAND. *Brit. M. J.*, 1958, 1: 5076.

THE PRESENCE of noradrenaline in vessel walls was established by the work of Schmiterlow in 1948, but so far there has been nothing to indicate that this noradrenaline plays any part in determining vascular tone. The experimental evidence given in this paper shows that the accumulation of noradrenaline can be dispersed by the action of reserpine in the course of several hours, and that when it is gone certain substances, among which are nicotine and acetylcholine, lose a vasoconstrictor action which they previously possessed. Nicotine and acetylcholine thus appear as substances able to release noradrenaline from this store. Some leakage of noradrenaline from the store perhaps occurs normally. If there is such a situation in blood vessels, the leak from the store may play some part in determining vascular tone. Clinical conditions such as Raynaud's disease and Buerger's disease seem to be due to a factor causing excessive tone, and on the basis of the experiments described might be benefited by treatment with reserpine. On the question as to whether noradrenaline is normally released from its store in the arteries and is a factor in determining vascular tone, there is at present only circumstantial evidence. The use of reserpine for peripheral conditions is limited by its effect on the central nervous system. What is needed is a quaternary compound which will not penetrate the blood-brain barrier. Unfortunately neither serpentine nor serpentinine, which are quaternary, have the same effect as reserpine.

—Robert A. Nabatoff, M.D.

Prognosis in Arteriosclerotic Peripheral Vascular Disease. SAMUEL SILBERT and HERMAN ZAZEELA. *J. Am. M. Ass.*, 1958, 166: 1816.

THE PURPOSE of this study was to determine the prognosis for life and limb in patients with arteriosclerotic peripheral vascular disease and to evaluate certain factors, such as the presence of diabetes, use of tobacco, association of hypertension, decade of onset of symptoms, and sex, in prognosis. Observations of the course of peripheral vascular disease were made in 1,198 patients. The patients with coexistent diabetes were found to have a 10 year mortality rate of about 38 per cent compared to 11 per cent for nondiabetic patients. Diabetic patients also had a much higher rate of amputations (34 per cent) than did nondiabetics (8 per cent). Severe hypertension was also associated with some shortening of life expectancy. The amputation rate was lower in patients who had stopped smoking than in patients who continued to smoke or had never smoked. When acute occlusion of the femoral artery occurred, the prognosis was again much better in the nondiabetic than in the diabetic patients. In a group of 39 patients who underwent sympathectomy no favorable effect on the amputation rate was seen. The life expectancy of patients with uncomplicated arteriosclerotic peripheral vascular disease is not shortened, compared with normal individuals. Eleven per cent of these patients die within 10 years and 33 per cent within 15 years from onset of symptoms. Acute femoral artery thrombosis is usually a relatively benign vascular accident in nondiabetic patients, and amputations are necessary in only 12 per cent. In the patients with diabetes the amputation rate is 32 per cent. On conservative management, 66 per cent of nondiabetic patients improve or the disease becomes stationary. In patients with diabetes, only 37 per cent respond in a favorable manner. This study indicates that conservative management of patients with arteriosclerotic peripheral vascular disease is fairly satisfactory in the nondiabetic patient but that the results in the diabetic patient are poor. It remains to be shown whether or not sympathectomy or vascular grafting procedures will improve the long term results in this group.

—Robert A. Nabatoff, M.D.

Has Injection Treatment of Varicose Veins Become Obsolete? EGMONT J. ORBACH. *J. Am. M. Ass.*, 1958, 166: 1954.

THE AUTHOR discusses the place of sclerotherapy in the treatment of varicose veins. Injection treatment should be used for superficial veins not communicating with deeper veins, varices remaining after radical surgery, recurrences of moderate degree, and spider veins; it should also be used for poor risk patients and occasionally for varices occurring during pregnancy, although these are best managed by elastic support and possibly estrone and progesterone administration. Contraindications include: large superficial veins with communications to deeper channels; allergic conditions; infections, such as acute superficial phlebitis; presence of underlying arterial disease; varices due to pelvic or abdominal tumors, unless the tumor has been removed; patients with uncontrolled diabetes, tuberculosis, asthma, neoplasms, or blood dyscrasis; and uncooperative patients who will not follow through with a course of injections or instructions.

Tetradecyl sulfate (sodium sotradecol) is recommended as the best sclerosing agent, especially when used with the airblock technique which consists of drawing 0.5 c.c. of a 3 per cent solution of sotradecol

into a syringe, retracting the plunger about 0.5 c.c., and shaking vigorously to produce a foam; the plunger is then retracted 0.25 c.c. to create the airblock, and the air, foam, and 0.1 c.c. of solution are injected into the vein with the leg dependent. After the injection the leg is placed horizontally, a gauze pad applied, and a blood pressure cuff inflated to 10 mm. above the diastolic pressure and placed around the leg, over the injection site, and kept in place for 5 minutes. A foam rubber compression dressing is then applied, followed by an elastic bandage from the metatarsus to the knee or higher, depending on the site of the injection. The bandage is removed 2 to 3 days later by the physician and thrombi and trapped blood evacuated by stab incisions. Injections may be given every 2 or 3 days, and after the initial injection, up to 5 may be given at one visit. There is no danger from air embolism when amounts of air not exceeding 8 c.c. enter the saphenous system. Sclerotherapy still has a definite place in the treatment of varicosities, although its use has been lessened by improved surgical techniques. —*Albert M. Schwartz, M.D.*

Superior Vena Caval Replacement; Successful Use of a Pedicle Tube Created from Right Atrium and Appendage. ANGELO RIBERI and THOMAS C. MOORE. *Surgery*, 1958, 43: 355.

SUPERIOR VENA CAVAL obstruction may be caused by a variety of intrathoracic lesions including neoplasms, chronic fibrosing mediastinitis, and aortic aneurysms. Some must be treated with palliation as the only goal but in others, long term relief might be expected if the vena cava could be successfully replaced. Up to the present time no satisfactory substitute has been found, although aortic homografts, dacron, ivalon, and nylon prostheses, as well as anastomoses between the superior vena cava and the right atrial appendage have been tried. The authors present a new method of dealing with this problem which consists of creating a pedicle tube from the right atrium and atrial appendage for anastomosis to the distal end of the divided superior vena cava. (The technical details are given, with diagrams.) The procedure was carried out in 24 dogs with no operative mortality. The patency and function of the atrial tubes and the anastomoses were studied by means of cavograms, subsequent sacrifice of 9 dogs, and by autopsies in 5 dogs who died in from 2 to 60 days after operation. All had patent tubes and anastomoses with one exception and in this dog, occlusion at the anastomotic site was caused by faulty suture placement although no thrombosis was present. In all cases the suture lines were well endothelialized and free of clot formation. The results of this study confirm those of Gerbode that in superior vena caval obstruction, atriocaval anastomoses tend to retain their patency and so do pedicle tubes made from the atrium and atrial appendage. The latter procedure allows more radical replacement of the superior vena cava and results in long term patency. —*Albert M. Schwartz, M.D.*

BLOOD; TRANSFUSION

Blood Banking for Intracardiac Surgery. W. NEWLON TAUXE and THOMAS B. MAGATH. *J. Am. M. Ass.*, 1958, 166: 2136.

THE AMOUNT of heparinized blood needed during an intracardiac operation using a Gibbon-type pump-oxygenator ranges from 6 half-liter units for small patients to 9 units for large patients; in addition, from 1 to 4 units of citrated blood must be on hand for supportive use after the period of heparin administration has been terminated by protamine administration. Experience has shown that ordinary blood from the blood banks is satisfactory for citration, but the heparinized blood must be fresh. It is collected on the morning of the operation by running 470 ml. of blood into a silicone-coated vacuum bottle containing 1,500 U. S. P. units of heparin in 30 ml. of saline solution. Before the bypass is instituted, the patient also receives by direct intravenous injection 1,500 U. S. P. units (approximately 15 mgm.) of heparin per 500 ml. of blood volume. Throughout the operation there is continual calculation of blood loss and replacement. Experience has made it possible gradually to eliminate many tests, such as plasma hemoglobin determinations, that formerly were made repeatedly during the period of heparinization. The large amounts of blood required (3,000 units per year for use in the machine) make it necessary to plan months ahead, and the crossmatching for a given patient is done 2 or 3 days before the expected date of operation. This program should be the primary concern of experienced, trained clinical pathologists and can develop a spirit of cooperation in all concerned, including the professional donors.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Some Observations on the Mechanism of Postoperative Transient Aldosteronism with Special Reference to Early Changes in Serum Electrolyte Levels. J. G. LLAURADO and M. F. A. WOODRUFF. *Surgery*, 1958, 43: 787.

CONVINCING EVIDENCE has been found that aldosterone plays an important role in the retention of sodium and increased excretion of potassium which follow surgical trauma. It has also been found that there is increased aldosterone activity in the urine of patients after operation and there is a significant correlation between the excretion level of aldosterone and the logarithm of the Na/K ratio in the patient's urine before and after operation. It has also been noted that by the time the Na/K ratio returns to its preoperative level, the aldosterone level has also returned to its preoperative level (postoperative transient aldosteronism).

The mechanism responsible for postoperative aldosteronism has not been elucidated but there is a good deal of evidence that aldosterone secretion is not under the direct control of the pituitary. Normal subjects fed high potassium diets show increased aldosterone excretion and the amount of aldosterone secreted by the perfused adrenal gland in vitro can be altered by altering (radically) the Na/K ratio of the perfusion fluid.

The authors postulated that after surgical operations, the increased serum potassium resulting from the absorption of potassium from injured tissue might stimulate the adrenals to secrete more aldosterone and that this increased secretion might continue for some time after the stimulus had ceased to operate. They studied adults of both sexes who were subjected to various operations and who showed no preoperative electrolyte imbalance or adrenocortical disturbance. The results showed that there is a temporary and, in most cases, significant rise in the level of serum potassium within 12 hours after all operations of moderate severity. The potassium level returns to approximately preoperative levels within 24 hours of operation, by which time there has been a fall in serum sodium.

There is also a postoperative rise in the urinary excretion of aldosterone, but the time at which this occurs varies greatly, and the extent of the rise shows no correlation with either the magnitude or the time relations of the serum electrolyte changes.

It is concluded that the postoperative rise in serum potassium is not the stimulus to postoperative transient aldosteronism. Instead, it is suggested that the findings are consistent with the hypothesis, recently suggested by Rauschkolb and Farrell, that a circulating trophic hormone is the stimulus to postoperative aldosteronism. This trophic hormone is believed to be elaborated by the diencephalon in response to a diminution in intracranial blood pressure or blood flow.

—*David E. Hallstrand, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

New Preparation for the Study of Experimental Shock from Massive Wounds. E. W. ALTON OCHSNER, JR., STANLEY W. JACOB, ARLIE R. MANSBERGER, JR., JACK H. OPPENHEIMER, and Others. *Surgery*, 1958, 43:703.

IN WORLD WAR I, World War II, and in the Korean Conflict a certain number of casualties with massive soft tissue wounds died in spite of competent, energetic, and sometimes heroic medical care.

Even though adequate hemostasis had been effected and blood volume restored, many of these patients succumbed to a shock state which could not be reversed by whole blood replacement. Ziperman, in a statistical survey of the causes of shock in the Korean war zone, listed soft tissue injury, especially in the gluteal area, as a common cause of hypotensive states in casualties.

The opportunity to observe clinical traumatic shock between wars is extremely limited. In order to study the problem of massive wounding, an experimental preparation was developed at the authors' laboratories which closely simulated the problem as encountered on the battlefield. The goat was used in these experimental studies because of its relative availability, docility, large size (about that of a small man), and its sturdiness. Texas angora wethers (castrated males), 4 to 5 years old, were selected.

The animals were placed on a special experimental table and injury was produced by detonation of cylindrical tetryl pellets (0.494 by 0.795 inches) placed on a predetermined site on both hindquarters. This target point was on a line one-quarter of the distance from the knee to the greater trochanter of the femur and at the midpoint of the muscle mass along that line. The size of the charge was carefully selected so that the detonation would produce approximately 100 per cent soft tissue damage from the pelvic brim downward. The wounds were remarkably uniform. Both femurs were comminuted, and all muscle groups were severed on the anterior, lateral, and posterior aspects of the thigh. The muscle bellies and connective tissue proximal to the point of detonation exhibited small areas of gross hemorrhage and petechial-like areas of injury up to the pelvic brim. The vessels were severed and thrombosed by the detonation. Intrapelvic and intraperitoneal damage was limited to a few small petechiae on loops of the small bowel, the cecum, and on the urinary bladder serosa.

Hemostasis was effected within minutes of injury by clamping obvious bleeding points. The generalized muscle ooze was controlled by loose packing of the wound with sterile cotton gauze bandage. The dressing was completed by enclosing both limbs in a section of sterile 6 inch stockinette. A plastic sheet was then placed over the dressing, clamped beneath the anus, and pinned over the skin of the pelvis to prevent direct fecal contamination of the wound.

During the survival period, the animals were kept in a constant temperature laboratory. Beginning 6 hours postinjury, the animals were given food and water, ad libitum. The initial blood loss was designated as that blood loss into a pan prior to the application of dressing. This loss was measured in a graduated flask. Subsequent blood loss was estimated by bandage weight techniques. The total blood loss was obtained by adding 100 c.c. to the sum of these two measured blood losses. This figure of 100 c.c. was judged more than adequate to allow for loss on hands and clothing. There was no demonstrable correlation between survival time and blood loss provided the initial blood loss did not exceed 15 c.c. per kilogram of body weight.

Ninety-six animals were used in the control group. The mean survival time for this group was 18.9 hours ± 0.98 hours. No significant variations were noted to occur between separate groups of animals in the course of the experiment. As a consequence the individual control groups were consolidated in the final statistical evaluation. It should be noted that all animals died as a result of the wounds inflicted. Animals in which the initial blood loss exceeded 15 c.c. per kilogram of body weight were discarded from the analysis, since it was demonstrated that in this range survival time was not independent of blood loss as previously mentioned.

It was demonstrated that loose dressings as employed in the standard preparation had no advantage over the omission of all dressing as gauged by survival of the animal. The application of pressure dressings, however, did prolong survival time to 24.7 hours.

Completely turning the animal from the prone to the supine position for 5 minutes and back again every fourth hour during the postinjury period significantly decreased the survival time. Most of the animals died shortly after one of the periods of positional change.

The effect of manipulations necessitated by physiologic studies had a profound influence in shortening the survival time. Because of this disclosure, all subsequent survival studies were completely divorced from simultaneous physiologic determinations.

The use of surgically accepted techniques resulted in significant prolongation of survival time. These techniques included: (1) depilation with strontium sulfide in the target area, (2) cleansing with hexachlorophene, (3) draping the carts and animals with sterile sheets, (4) the use of sterile clamps for hemostasis, and (5) employment of caps, masks, sterile gowns, and sterile gloves by the experimenters. That a bacterial factor may be involved in some way in the death of the traumatized animals is suggested by the fact that observance of aseptic techniques before and after injury significantly prolonged mean survival.

EVALUATION OF VARIOUS THERAPEUTIC REGIMENS WITH SPECIAL REFERENCE TO THE ROLE OF ANTIBIOTICS, FLUID REPLACEMENT, AND DEBRIDEMENT

In this group of studies the same type of animals were used and shock was produced by the same blast injury technique. The variables were confined (insofar as possible) to methods of therapy. Concomitant physiologic studies were kept to a minimum since it was previously established that relatively minor manipulation (that is, blood sampling for chemistries and direct arterial blood pressure measurements) significantly reduced survival times.

Therapy was separated into the following general groups: (1) treatment by fluid replacement, (2) treatment with antibiotics, (3) treatment with fluid replacement plus antibiotics, and (4) treatment with fluids, antibiotics, and wound debridement.

The control groups of animals have been consolidated for purposes of statistical analysis. The mean survival time for the consolidated control group was 19.6 hours.

Fifty animals were treated after injury with whole blood alone, blood plus dextran, or with dextran alone. Aseptic precautions were observed when blood was drawn, and random cultures done periodically on donor blood were sterile.

Those animals which were given at least 1,000 c.c. of whole blood in excess of the measured total external blood loss survived a mean of 36.4 hours. When only 500 c.c. of whole blood in excess of the measured 2 hour external blood loss were given to 10 animals after injury, the mean survival was 29.6 hours. In the group of animals which were given 1,000 c.c. of dextran followed by whole blood so that the total input was 1,000 c.c. in excess of the total measured external blood loss, the mean survival time was 23.8 hours. When the maintenance of a normotensive arterial blood pressure was the criterion for the administration of blood or dextran plus blood, the animals survived a mean of 21.3 hours, an increase in survival time which is not statistically significant. Animals treated with 500 c.c. of dextran in excess of the measured 2 hour blood loss survived for a mean of 16.1 hours, a decrease in survival time which is statistically significant.

One hundred seventeen animals were treated with parenteral antibiotic therapy. The results of systemic antibiotic therapy are tabulated. The mean survival time of animals treated with penicillin prior to and following injury was 55 hours. Delaying treatment until the immediate postinjury period did not significantly alter the mean survival time. However, a delay of 12 hours prior to the beginning of therapy lowered the mean survival time to 25 hours. When animals were treated by the intramuscular injection of penicillin, procaine penicillin was superior in effect to aqueous crystalline penicillin even though the dosage of the aqueous variety was somewhat higher. The mean survival times of these two groups of animals were 51.3 and 32.9 hours, respectively.

Fifteen animals treated with intramuscular injections of dihydrostreptomycin showed no increase in survival times. However, when penicillin and dihydrostreptomycin were used in combination, the mean survival time was increased to 62.6 hours.

The mean survival times of animals which received aureomycin hydrochloride and chloramphenicol intravenously were 66.8 and 63.6 hours, respectively.

With the exception of the streptomycin group and the penicillin group, when treatment was begun 12 hours after injury, the increase in survival time of all animals treated by the intramuscular and/or the in-

travenous administration of antibiotics was statistically significant.

In the pretreatment groups neomycin was more effective in lowering the fecal bacterial count than was aureomycin. The blood level of aureomycin on the third treatment day varied between 2.5 and 5 micrograms per cubic centimeter of serum. Levels for neomycin were consistently zero. The mean survival time for animals pretreated with aureomycin was 39.1 hours (a significant increase) while the mean survival time of animals pretreated with neomycin was 15.2 hours. The latter figure is not significantly different from the mean survival time of control animals.

In 9 animals from which oral aureomycin therapy was withheld until the immediate postinjury period, the mean survival time was 21.2 hours.

Forty-nine animals were given treatment with fluid replacement plus antibiotics. When whole blood was used in combination with an antibiotic, a synergistic effect was observed. The mean survival times for those animals treated with penicillin and blood in combination was 98.6 hours. When compared to transfusion therapy alone (mean survival time 36.4 hours) and to penicillin therapy alone (mean survival time 55 hours), the synergistic effect is rather striking. The mean survival times of animals treated with aureomycin and blood transfusions in combination also show an increase over the mean survival times of animals in which these agents were used individually as methods of therapy.

Eighty-four animals were treated with fluids, antibiotics, and wound debridement, (bilateral hip disarticulation).

It is only in those treated by debridement that permanent recovery from the shock syndrome is found. With effective fluid replacement, local cooling (crushed ice), and antibiotic therapy, definitive surgery could be delayed for as long as 24 hours with permanent survival. The importance of being able to postpone definitive surgery is obvious in military and mass casualty situations when surgical intervention may not be possible for many hours or days. The beneficial effect of local wound cooling in this preparation cannot be overemphasized. Without local cooling it was necessary to debride within 4 hours of injury to get indefinite survivals.

The results of these experiments focus attention on two aspects of the wound shock problem: (1) the role of the local wound in irreversibility and (2) the importance of the bacterial element in the pathogenesis of this syndrome.

From the experimental data it would appear that not only is a bacterial factor involved in some way in the irreversibility of shock, but also that the primary site of detrimental bacterial activity is the open wound.

EFFECT OF LOCAL WOUND TREATMENT ON SURVIVAL TIME

In the previous wound shock experiments it was found that survival times were significantly increased in animals treated with parenterally administered antibiotics and that this prolongation of survival time was greater than that seen when blood replacement was the sole therapy used. When the number of organisms in the gastrointestinal tract was decreased by the oral administration of antibiotics, the survival time was not increased unless the antibiotic was absorbed into systemic circulation. On the other hand, debridement of the wound coupled with transfusion and antibiotic therapy resulted in indefinite survivals.

The role of bacterial action in the irreversibility of experimental hemorrhagic shock has been emphasized by Fine and associates. In their hemorrhagic shock preparation, they have not been able to assign, with certainty, the site of detrimental bacterial activity. However, in shock from massive wounds, such as occurs in this experimental preparation, it seemed reasonable to investigate the wound itself as a possible source of bacterial activity which might contribute to the development of the irreversible state. Consequently, a series of these survival experiments were carried out in which therapy was confined to the wound. It would seem that this type of study would be especially pertinent to the treatment of mass casualties.

It is difficult at best to interpret any experimental finding on animals in the light of therapy of human beings. The authors do not suggest that the local forms of treatment described in detail be used solely for the treatment of wound shock, especially when adequate blood and blood substitutes are available. Everyone recognizes that there is no substitute for blood loss as effective as whole blood replacement. However, in the event of large numbers of casualties, blood and effective means of surgery will not be available to everyone, and it is the purpose of this group of studies not only to add some knowledge regarding the etiology of wound shock but also to suggest possible effective means of prolonging life, if and when the combination of large numbers of casualties and lack of immediately available hospital facilities and surgical skills constitute a reality. With this in mind, the following possible treatments are suggested.

1. If it is obvious that amputation is inevitable in an extremity wound, these experimental findings suggest that the application of a tourniquet to the wound and the application of ice, or other forms of local cooling, if available, to the extremity may be an effective means of prolonging life. When possible, this should be done in combination with systemic antibiotic therapy.

2. If the wound is in an area where application of a tourniquet is not feasible or if the wound is an extremity wound in which blood loss has been controlled and a viable limb is expected as an end result, the use of systemic antibiotics plus local cooling of the wound may be efficacious. It is cautioned, however, that the application of ice should be tempered at all times by sound clinical judgment so that irreversible changes do not occur in the vascular tree.

3. If antibiotics alone are available, previous work has shown that systemic antibiotic therapy is effective in prolonging survival. It is reasonable to assume that systemic therapy may be even more efficacious if combined with antibiotic wound irrigations. Further study is necessary to indicate final antibiotic superiority.

4. If no other means of therapy are available, there is some experimental evidence that the simple ex-

pedient of cleansing the wound with water may be effective in prolonging life in wound shock.

The mere surface washing or surface irrigation of the wound does not effectively prolong survival. The fact that all of these irrigations were forceful into areas of damaged muscle is probably an important factor in prolonging survival. The moderately anoxic areas of damaged muscle within the wound are excellent areas for bacterial growth. Forceful irrigation of these damaged muscles directs therapy to these vital areas.

THE EFFECT OF PENICILLIN AND STREPTOMYCIN ON THE QUANTITATIVE BACTERIOLOGIC FLORA OF THE WOUND

The preceding survival studies suggested that bacteria proliferating in the wound might yield the postulated toxic factor, either by the elaboration of classical toxins or by the breakdown of normal tissue constituents.

Because of the strong likelihood that bacterial experimental activity in the wound might play an important role in the early death of the experimental animals, attention was focused on the bacteriology of the wound.

The data gathered in these experiments taken in conjunction with the survival studies make it likely, although far from certain, that the primary offending bacteria are of the gram-positive penicillin-sensitive variety. The failure of streptomycin to prolong the survival time could be interpreted on the basis of its primarily gram-negative antibacterial range; alternatively, one could ascribe the therapeutic failure to the fact that streptomycin appears to act later than penicillin in suppressing bacterial growth. However, the origin and nature of the bacteria operative in hemorrhagic shock have not been defined.

CHANGES IN SOME SERUM ELECTROLYTES AND NITROGENOUS FRACTION VALUES

In this group studies were made on the sera of uninjured animals in which lethal shock was induced by the intravenous injection of endotoxin prepared from a pure culture of Escherichia coli.

It is interesting to note that in all three classes of animals used in these experiments, nearly identical changes occurred in the substances measured. Within comparable time intervals, that is, from 0 to 24 hours after wounding or toxin injection, the only variation seemed to be differences in magnitude. The continued rise of the nonprotein nitrogen, blood urea nitrogen, creatine, and creatinine levels in the animals treated with penicillin is indicative of major impairment of renal function and/or greatly increased endogenous production. Further investigations to clarify this issue are being undertaken.

In most instances in the literature amino nitrogen concentrations have been found to rise in shock. Most probably the goat is better equipped to maintain amino nitrogen levels than other species since our data appear to show no changes in amino nitrogen levels.

In animals subjected to this type of stress the level of circulating electrolytes appears to be controlled. During the course of shock, the amounts of these elements change very slowly until terminal stages are reached.

The identical magnesium concentrations in the terminal samples from the penicillin-treated wounded animals are noteworthy. It is known that the circulating levels of adenosine triphosphate are greatly increased in wounded animals. Further, adenosine triphosphate is much more toxic in higher concentrations if magnesium ion is present in appreciable amounts. This level may then be the maximum concentration tolerated by the animal. An alternate possibility is that this concentration of magnesium represents the maximum effort of some mechanism important in the response of the animal in stress.

PAPER ELECTROPHORETIC STUDIES OF THE SERUM PROTEINS

Adequate studies of the serum protein changes of animals in which shock is produced by massive soft tissue wounds are lacking. The multiplicity of the stress, that is, hemorrhage, soft tissue destruction, and bacterial contamination, would seem to indicate that such changes should occur.

Two groups of wounded animals were studied: (1) control animals receiving no treatment other than hemostasis and (2) animals receiving penicillin or aureomycin before wounding and every 8 hours thereafter. In addition, a third group of unwounded animals were given intravenous injections of gram-negative endotoxin in an attempt to ascertain which of the observed changes might be attributed to the metabolism of the bacteria present in the wound site. The endotoxin was prepared from a pure culture of Escherichia coli which was taken from the wound of a goat.

Ten cubic centimeter blood samples were taken within one hour before wounding or injection of the toxin; subsequent samples were taken at 6, 14, 18, and 24 hour intervals thereafter until the death of the animals. After withdrawal the blood was allowed to clot and left standing several hours until the clot had contracted. The sample was then centrifuged and the serum withdrawn and frozen until electrophoretic separation was carried out.

As a control measure a group of 5 animals were immobilized and given dosages of penicillin comparable to the dosages given the antibiotic-treated wounded animals. No significant changes were observed in the distribution of protein fractions in the sera of these animals.

Another group of animals were bled until the blood pressure decreased to 70 mm. Hg. Blood samples taken after 48 hours displayed suggestions of changes in the beta regions in one case; otherwise, the electrophoretic patterns were normal.

It would appear that the marked change in the beta globulin fraction observed in the penicillin-treated wounded animals probably can be accounted for by the greatly increased survival times of the animals. Several agents important in the animal's response to stress are carried in this fraction. With antibiotic therapy, endogenous mechanisms of defense become increasingly more prominent as the animal's survival time is increased.

1. Control wounded animals showed an early increase in the relative amounts of alpha-2 globulins in the blood serum.

2. Antibiotic-treated wounded animals which survived much longer than control animals showed a marked change in the beta globulin fraction after a survival period of 24 hours or more.

3. In animals in which shock had been induced by the intravenous injection of lethal amounts of endotoxin no changes were seen in the relative percentages of serum protein fractions.

—*John E. Kirkpatrick, M.D.*

The Treatment of Tetanus in Infants (Le traitement du tétanos chez l'enfant). C. MARTIN, ST. THIEFFRY, E. BARGETON, E. HABIB, and JACQUELINE SORREL-DÉJERINE. *Sem. hôp. Paris*, 1958, 34: 207.

IN MANY INSTANCES, the classical treatment of tetanus —antiserum, penicillin, sedatives, and ganglioplegics in small doses—is adequate and successful therapy for tetanus in infants. There are certain factors, however, which point to the inadequacy of this regimen: the incubation period, which if less than 5 days, culminates in 100 per cent lethal tetanus; the time of the appearance of convulsions, which if less than 48 hours following the appearance of trismus, is a grave prognostic omen; and finally, hyperthermia, tachycardia, and the number and duration of apneic crises have serious connotations. In these situations the authors advocate curarization and controlled artificial respiration as part of the therapy of tetanus.

The principles of over-all management include the following: (1) At the first sign of trismus, tetanus antitoxin is given. (2) The infant is isolated in an environment free from noise, which is equipped to provide whatever nursing care and medications are necessary. (3) The treatment is directed toward avoiding paroxysmal crises: a vein is cannulated for the inlet of fluids, electrolytes, calories, and medications, and, if there are generalized convulsions, a tracheotomy is performed.

Sedation is effected by the intravenous route. Main reliance is on chloral hydrate and calcium bromide with or without added phenergan or largactil. The tracheal toilet is of paramount importance. If these drugs do not control the convulsions, d-tubocurarine, 1 to 5 mgm. intravenously, is given and artificial respiration instituted. The care of the patient is then similar to that of the patient afflicted with poliomyelitis. Tachycardia is the most reliable sign of hypoventilation. In severe cases artificial respiration, once instituted, may have to be continued for 8 to 15 days. Caloric intake is absolutely essential, and is usually carried out by gavage. —*Edwin J. Pulaski, M.D.*

ANESTHESIA

Diagnosis and Treatment of Disturbances of Ventilation (Diagnostic et traitement des troubles de la ventilation). J. CROSNIER. *Presse méd.*, 1958, 66: 565.

THE DIAGNOSIS of disturbances of ventilation is relatively easy, but the determination of the respiratory efficiency should be made with the help of a spirometer.

To find the cause of the disturbed respiration seems not to be too difficult. The history, and a thorough clinical and x-ray examination usually permit one to establish a pulmonary, hematologic, or tissue cause.

Finally, it is possible by clinical and biological methods to evaluate the degree of respiratory disturbance on the basis of the oxygen used and the output of carbon dioxide by the organism. The determination of the degree of oxygenation of the blood can be made by: (a) a direct method with the help of the Van Slyke apparatus, (b) an indirect transcutaneous method, and (c) an indirect method in vitro.

The degree of elimination of carbon dioxide is easy to determine. Clinical symptoms are early and constant when the retention or loss of carbon dioxide is increased. An elevation of the blood pressure, bradycardia, and abundant perspiration are present when the percentages of carbon-dioxide are high. The hypocapnia results in tachycardia and a fall in the blood pressure. The determination of the pH, pCO_2, and bicarbonates is necessary to confirm with certainty the retention of carbon dioxide.

TREATMENT

Syndrome of hypoventilation or oligopnea

An obstacle in the respiratory system usually is manifested by a drawing in of the epigastrium during inspiration but an endoscopic examination could be necessary. Despite the presence of anoxia, treatment by the inhalation of oxygen in these cases is illogical before removing the obstacle.

In cases of a high and benign obstruction lowering the head in a sloping position is sometimes enough to evacuate the mucus. The use of an airway helps in more severe cases. When the obstacle is situated a little lower the patient should be treated with instrumental help, such as laryngeal aspiration, intubation, or tracheotomy.

For respiratory paralysis the application of oxygen therapy is not sufficient if not combined with artificial respiration, given manually or with the help of iron lungs or a similar device. The surveillance of the clinical condition of the patient and a check of the pH, pCO_2, and oxyhemoglobin saturation are indispensable to be sure that the appliances are functioning properly. Equally important is the proper humidity of the inhaled air.

Syndrome of hyperventilation or polypnea

Lack of oxygen in the inspired air is a result of a low saturation of oxyhemoglobin and is associated with hypocapnia. Oxygen therapy with a higher concentration of oxygen than in surrounding air is required for treatment.

Advanced alteration of the pulmonary tissue such as the pulmonary alveoli can make the lung partially or completely impermeable for the exchange of gases, as in the course of pneumopathies, in pulmonary emphysema, or pulmonary edema. The result is anoxia with hyperventilation and hypercapnia, normocapnia, or sometimes hypocapnia. The last occurs during the care of an extended pulmonary atelectasis or retraction of a pulmonary stump. Oxygen therapy should be given alone when the percentages of carbon dioxide are normal. When hypocapnia is present later administration of depressant drugs is indicated.

In neurological impairments hyperventilation can be observed in the course of infectious diseases ac-

companied by severe intoxication. The treatment consists of the administration of selective depressant drugs such as opiates and barbiturates.

In anemias the decrease in the red blood count is the cause of hyperventilation. Treatment consists of oxygen therapy and blood transfusions.

In circulatory insufficiency the fall of the cardiac output with a disturbed peripheral circulation explains the low content of oxygen in the blood capillaries, even though the pulmonary oxygenation is normal. The treatment of the heart failure is essential with additional oxygen therapy.

In metabolic acidosis a decrease of the bicarbonates results in hyperventilation. The correct therapy is administration of bicarbonate and correction of the metabolic acidosis. —*M. Srokowski, M.D.*

SURGICAL INSTRUMENTS AND APPARATUS

Studies on Artificial Heart-Lung Apparatus. Itsuro Fukukei, Yotaro Iyomasa, Tetsuzo Akutsu, Shigehiko Shichino, and Others. *Nagoya J. M. Sc.*, 1958, 20: 263.

The authors relate their studies of various types of artificial heart-lung pump and oxygenators in Japan. The studies were begun in 1951 and carried through to the present date by utilizing various pumps available at that time and modifications constructed by them. An early oxygenator devised by the authors consisted of 30 metal columns, 40 cm. in length and 1.6 cm. in diameter, in which venous blood flowed down the surface of the column in a thin film and was mixed in a small reservoir prepared in the midst of columns in order to increase the oxygenation rate. The number of columns used could be varied to satisfy the volume of blood flow required. Oxygen was piped into the columns of metal over which blood flowed. This type of oxygenator was later replaced by an apparatus utilizing discs arranged in spiral fashion around a central axis. The discs are 15 cm. in diameter and extend in spiral fashion along the rotating axis for a distance of 30 cm. in length. The container for the blood about the rotating discoid spiral is cylindrical and the radius is approximately 1.5 cm. greater than that of the discs. The filming surface of the disc is about 1 square meter. Blood is sent slowly from the venous side to the arterial side via the spiral to contact oxygen. The rate of rotation is generally maintained between 70 and 110 r.p.m. and oxygen is delivered at the rate of 20 liters per minute. Damage to the blood is negligible. The oxygen saturation rate with this apparatus could be maintained between 80 to 100 per cent at 70 r.p.m.

The authors also present a summary of their experience with reference to anoxia, postoperative bleeding, air embolism, arterial and venous blood pressures, red cell count, hemoglobin values, hematocrit values, blood pH, hemolysis, and survivals. They performed experiments bypassing the left side of the heart, the right side of the heart, and made observations of the pulmonary valve under direct vision. With the modified disc type oxygenator 3 of 4 dogs in which the artificial heart-lung experiments were made survived extracorporeal circulation. Extracorporeal time varied from 20 to 38 minutes. Right ventricular incision was performed in 6 dogs and of these 4 survived. Extracorporeal circulation time in the survivors was 19 to 23 minutes. The cause of death in 2 cases was bleeding from the incision wound in the right ventricle and failure of postoperative aspiration of the thoracic cavity. Reference should be made to the original article for details concerning measurements of blood pH, lactic and pyruvic acid content, and arterial blood pH. Plasma hemoglobin levels varied from 50 to 300 mgm. per cent. —*Allan D. Callow, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

The Possibility of Roentgenologic Demonstration of the Pulmonary Artery (Beitraege zu den Roentgen-Darstellungsmoeglichkeiten der Pulmonalarterie). A. Bogsch. *Fortsch. Roentgenstrahl.*, 1958, 88: 401.

On the author's service at the University of Budapest, Hungary, methods have been studied for diagnosing disease in the pulmonary artery which might be used when serial roentgenograms with positive contrast material, are contraindicated. The preferred method of examining the pulmonary artery in cases of cardiac defect is pneumomediastinography.

Pneumomediastinum is produced by presacral insufflation of air into the retroperitoneal tissues (1,500 to 2,000 c.c.). The tomographic roentgenogram is made after 24 hours when the insufflated air reaches the mediastinum.

On frontal projection with the depth of the tomographic plane at the level of the left border of the vertebral column there is a continuous arc, consisting of the right ventricle of the heart, the pulmonary conus, the main trunk of the pulmonary artery, and its main left branch. The upper border of the pulmonary artery is sharply delineated and is separated from the horizontally directed portion of the aortic arch by a layer of air. The lower concave border of the pulmonary artery can only rarely be identified and measuring this vessel is difficult and can be done only where it crosses the posterior wall of the trachea.

The second oblique diameter of the thorax, the dextrosinistral projection, shows two crossing arcs of shadow, one composed of the right ventricle and pulmonary conus and the other of the ascending aorta and aortic arch. Normally the right ventricle and conus fall into the shadow of the aortic arch, but this is the best projection for determining enlargement of the right ventricle. With this projection only a small initial portion of the conus and pulmonary trunk, as well as the upper, contour-producing portion of the aorta is visible. With the tomographic technique combined with that of pneumomediastinum, a projection can be found where lengthy portions of both arcs can be delineated separately and a number of details demonstrated. Some authors use pneumopericardium in conjunction with this method.

The division of the pulmonary artery into right and left branches can hardly be demonstrated without the use of positive contrast material (angiocardiography).

The left branch of the pulmonary artery, representing the continuation of the pulmonary trunk, is more easily demonstrated and measured. It appears in the first oblique projection frequently in the form of a circular shadow, located in the upper end of the shadow of the pulmonary trunk; it may sometimes be possible to measure it, but proper posturing of the patient and apparatus may be difficult. When it is properly projected its approximate size may be determined. The ratio between the size of this branch and that of the aorta is normally about 1 to 1.5. When the shadow of the left branch of the pulmonary artery is present as the result of its angular course, the shorter diameter is the one which should be measured.

On frontal tomographic exposure at the level of the trachea with pneumomediastinum, the image of both the aorta and the left pulmonary branch appears in the form of circular, rather sharply delineated shadows.

The right branch of the pulmonary artery courses in the frontal plane from left to right and forms an angle of varying size with the left branch; only its distal portion can be clearly demonstrated as a structure of the hilus region of the lung. With the aid of pneumomediastinum and in transverse projection of the tomogram, it may be visualized behind the ascending aorta and in front of the trachea as a circular shadow. —*John W. Brennan, M.D.*

Roentgen Observations of the Ileostomy in Patients with Idiopathic Ulcerative Colitis; Ileostomy Dysfunction. Felix G. Fleischner and Paul Mandelstam. *Radiology*, 1958, 70: 469.

Roentgen studies of the morphology and function of the small intestine in patients with well functioning ileostomies and in those with ileostomy dysfunction have revealed different patterns. The term ileostomy dysfunction suggested by Warren and McKittrick describes the syndrome of obstruction with prestomal ileitis and fluid and electrolyte imbalance. In the patient with a well functioning ileostomy, the transit time for orally administered barium and the motility pattern of the small intestine are the same as in a normal subject without ileostomy. The lower ileum is capable of inspissating its contents to a soft solid mass. The prestomal ileum visualized by the use of barium enema through the ileostomy is normal in width and contour and shows a circular, normal rugose pattern; there is no dilatation.

In patients with ileostomy dysfunction, roentgenograms of the abdomen may reveal varying degrees of intestinal obstruction. However, these findings are not in themselves diagnostic. In none of the patients with dysfunction could causes of obstruction be found in the more proximal portion of the intestine. In general the area of malfunction appears to lie in the cutaneous ileostomy ring and the dilated area immediately proximal to it. In subjects with dysfunction, the prestomal ileum is markedly widened in diameter ranging from 4 to 10 centimeters against a normal of 2 to 3.2 centimeters. Kerckring's folds were more widely spaced and in some instances were absent in the terminal loop. In no patients with ileostomy dysfunction were formed feces found in the prestomal ileum. Oral administration of barium further shows gross delay in transit through the small intestine in patients with dysfunction.

Although the roentgen criteria appear to be quite uniform, the clinical manifestations of ileostomy dysfunction are of course extremely variable. This picture of dysfunction and obstruction in the broad sense does not correlate necessarily with morphologic

narrowing of the stoma or stricture of the terminal ileum. On the contrary, it is a functional concept. This was confirmed by the observation of the failure of a forceful contractile wave to propel barium through a malfunctioning stoma, despite an apparently satisfactory-sized lumen.

It is the authors' belief that the severe inflammatory changes seen in the prestomal ileum are more often the result of nonspecific changes due to the ileostomy dysfunction than to aggravation of residual disease. It is also of interest that ileostomy dysfunction may occur at any time in the life of a patient even though many years have elapsed without any difficulty.

Thus giving a barium enema is most helpful in demonstrating an abnormal ileostomy.

—Hermes C. Grillo, M.D.

The Practical and Scientific Employment of the Image Amplifier and X-Ray Television (Die praktische und wissenschaftliche Verwendung der elektronischen Bildverstaerkung und des Roentgenfernsehens). R. JANKER. *Fortsch. Roentgenstrahl.*, 1958, 88: 377.

FLUOROSCOPY combined with x-ray television and the image amplifier is compared, under four different aspects, with the ordinary fluoroscopic method. The image amplifier is also known as the "picture intensifier" (*Internat. Abst. Surg.*, 1957, 104: 591), and the "roentgen image intensifying" or "definition screen" (*Internat. Abst. Surg.*, 1957, 105: 201).

The first consideration is whether the combined method necessitates a smaller irradiation dosage than does the usual fluoroscopic examination; the second, whether the combined method presents sufficient detail; the third, whether the contrasts will be sufficiently pronounced; and the fourth, whether the method may be too cumbersome and difficult for ordinary use.

With regard to dosage it is pointed out that in the usual fluoroscopic study of the lung with the fine grid and 1 mm. aluminum filter (for the normally proportioned patient) and with 80 kv., 2 ma., and a focal distance of 35 cm., the dosage received by the patient corresponds to 9.4 roentgens per minute; when the aluminum filter is increased to 3.0 mm. in thickness, to 5.6 roentgens per minute. With the combined method and with a 3 mm. aluminum filter, 90 kv., 1.5 ma., and a 50 cm. focal distance the irradiation dosage is only 1.5 roentgens per minute.

In regard to detail it was found that with a specially constructed phantom of different sizes of wire at different spacings, the definition with the 13 cm. image amplifier was superior to that observed with the usual fluoroscopic method and with x-ray television, and that the detail recognizable with the combination of x-ray television and the image amplifier was about equal to that afforded with the ordinary fluoroscope.

In regard to the depth of shadow, it was found that with a phantom consisting of plaques of differing opacities the combined method cast deeper shadows and detected opacities which would escape observation by the usual fluoroscopic method. The author believes that the combined method will permit the demonstration of gallstones which would otherwise be invisible.

It is admitted that the combined method is a rather cumbersome procedure, but this handicap is being rapidly remedied.

The combined method has other advantages. An important one is that the image from the fluoroscopic screen can be carried by television to another room, where it can be studied by a number of observers simultaneously and without irradiation hazard to themselves. The author sees a bright and rapidly expanding future for the combined method.

—John W. Brennan, M.D.

MISCELLANEOUS

The Influence of Iron Metabolism on the Function of the Suprarenal Cortex (Die Wirkung des Eisenstoffwechsels auf die Nebennierenrindentaetigkeit). H. BIEFER and W. OTT. *Helvet. chir. acta*, 1958, 25: 26.

SIXTEEN NORMAL CONTROLS, consisting of 10 nurses and 6 patients, were given the iron-resorption test of Jasiński. The fasting patients were given 8 pills of feronnicum (Sandoz), 176 mgm. of ferro-iron, at 7 a.m. Determinations of the serum iron were made immediately and after 3 hours. The 17-ketosteroids in a 24-hour specimen of urine were also measured. It was found that 11 of the 16 patients gave lowered fasting values for serum iron, and that with the lower values for iron the urinary excretion was on the lower border of the normal.

Ten additional patients (8 women and 2 men), in whom low fasting values for serum iron had been determined, were given the Jasiński test as described and the 17-ketosteroid excretion measured in the 24 hour specimens of urine. These patients were then given iron for several weeks, usually ferrum (Hausmann) intravenously for a total dosage of 30 to 40 c.c. Daily peroral doses of 3 pills of ferronicum (Sandoz) were occasionally substituted for the intravenous administration. Following the treatment a second Jasiński iron resorption test was made and the 17-ketosteroids in a 24 hour urine specimen measured.

After the iron therapy a decided change toward normalization of the fasting serum iron values was observed in all the patients, and in all except one there was a more or less pronounced increase of the 17-ketosteroid excretion in the 24 hour urinary specimen. In only 2 of this group was the increase less pronounced. These were older patients with involution of the suprarenal cortex which was presumed to be of senile origin. In the one instance in which the ketosteroid values did not increase the patient had been given 20 units of ACTH intravenously before the initial test, but no ACTH was given before the second test.

In the authors' opinion the results suggest that an increase in iron metabolism activates the suprarenal cortex. This gives further substantiation to Ott's theory (*Helvet chir. acta*, 1955, 22: 183; abstract in *Internat. Abst. Surg.*, 1956, 103: 195) that larval iron deficiency increases the liability to shock.

—John W. Brennan, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Observations Concerning Bacterial Defense Mechanisms During Hypothermia. E. J. FEDOR, BERNARD FISHER, and EDWIN R. FISHER. *Surgery*, 1958, 43: 807.

THE USE of hypothermia has been suggested to combat infection. The authors in previous work have found that hypothermia, even after many hours, does not promote a state of bacteremia, and that hypothermic animals remain capable of removing pathogenic organisms injected into the blood stream. In order to evaluate the antibacterial mechanism during hypothermia and in rewarming, the authors studied the leucocyte counts, phagocytic indices, and electrophoretic patterns of the serum of hypothermic dogs. The phagocytic index represents an approximate expression of the capacity of the blood to phagocytose E. coli.

Leucopenia does exist under hypothermia, but only for a transitory period after which the leucocytes return to normal. This is accompanied by a marked shift to the left and an outpouring of band neutrophils. There was no indication of reduction in the phagocytic powers of the leucocytes during hypothermia or in the rewarming phase. Therefore, in view of the fact that hypothermic animals innoculated with bacteria do not clear their bloodstream as rapidly or efficiently as normothermic animals, the authors propose that this must result from the trapping and intermittent release of contaminated blood as well as perhaps a decreased blood flow to the phagocytic centers.

In addition, on the basis of their study of the electrophoretic patterns of the plasma in hypothermia, the authors find no decrease in plasma proteins in animals cooled from 4 to 8 hours. Partition of the pattern demonstrated no statistical difference throughout the experimental periods in alpha, beta, and gamma globulins. It is therefore concluded that the phagocytosis promotion factor (PPF) described by Tullis remains present at all times. These studies therefore indicate a maintenance of the immunologic response during cooling and rewarming. When this is coupled with the observation of Eiseman, that bacterial multiplication is inhibited during hypothermia, there appears to be a rationale for the use of hypothermia in combating infection.

—*Hermes C. Grillo, M.D.*

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Thoracic Actinomycosis. EWART M. JEPSON, F. CLIFFORD ROSE, and RICHARD D. TONKIN. *Brit. M. J.*, 1958, 1: 1025.

ACTINOMYCOTIC INFECTION is not a rare condition and its favorable response to antibiotics is reason for considering it high on the list in the differential diagnosis of obscure infective conditions. Cope has classified thoracic actinomycosis into three types: bronchial, parenchymal, and mediastinal. The bronchial type is rare with slight symptoms of bronchitis and actinomyces in the sputum. The parenchymal form of the disease begins in the lower lobes of the lungs with eventual involvement of the remaining lung. Early pleural effusion which becomes purulent and progresses to empyema formation is common. This may be followed by infiltration of the thoracic wall with an overlying abscess. The mediastinal type readily invades the thoracic wall with early abscess formation. Pleural effusion and empyema are common and early features of this form of this disease. Thoracic vertebral bodies are often involved.

Actinomyces israeli has been considered the sole causative organism until recently. The common occurrence of other bacteria in the infectious process has led to the belief that it is probably a synergistic bacterial infection. The most commonly associated organism would appear to be a gram-negative aerobic coccobacillus named Bacillus actinomycetem comitans. Not only is the actinobacillus found frequently in the pus of actinomycotic lesions but, in addition, this particular bacillus has not been found in any infection other than actinomycosis. Holm believes that actinomycosis is a multiple infection arising from a synergism between the Actinomyces israeli and associated organisms.

The commonly held theory that the ray fungus is conveyed to man from vegetable sources such as grass and soil is no longer tenable. Actinomyces israeli is probably not the same species as the Actinomyces bovis of cattle actinomycosis, nor is it the same usually aerobic form found in grasses and soils. Actinomyces israeli is often found in carious teeth and infected tonsils of normal people. In order for the infection to become established, it is probably necessary that local trauma, reduced resistance, or associated synergistic aerobic bacteria be present. Pulmonary infection may originate through inhalation, penetration of the esophagus, extension from the cervical region via the mediastinum, or retroperitoneal extension from below the diaphragm.

A characteristic infection in the bone, which appears to have a specific roentgenographic appearance, may occur. Invasion of the bone may occur through direct extension or blood stream involvement. The characteristic picture is that of an osteitis, which is illustrated in the roentgenograms that accompany the authors' case reports.

The antibiotic sensitivity of Actinomyces israeli varies, but in general the majority of strains are sensitive to less than 0.5 mgm. of penicillin per milliliter. The actinobacillus is normally insensitive to penicillin, but sensitive to streptomycin. The treatment of choice for patients with thoracic actinomycosis would therefore be combined therapy with penicillin and streptomycin, the penicillin therapy being continued for a long period of time. In recurrent or advanced cases it may be necessary to give the penicillin for as long as 6 months. Failure of antibiotic

therapy may be due to insufficient antibiotics reaching the lesion as a result of avascularity or fibrosis.

Two case reports are presented in detail with accompanying roentgenograms which illustrate the lesions. —*John H. Davis, M.D.*

DUCTLESS GLANDS

Changes in the Thyroid, the Pituitary, and the Adrenal Glands of Normal Rats and of Ovariectomized Rats Treated with Lipoid Extracts of the Hypothalamic Nuclei (Modificazioni della tiroide, dell'ipofisi e del surrene di ratte normali e di ratte ovariectomizzate sottoposte a trattamento con estratti lipoidei dei nuclei ipotalamici). PIETRO RAGONESE. *Riv. ostet. gin.*, Firenze, 1958, 13: 18.

THERE IS an important and well known relationship between the hypothalamus and the endocrine glands. The action of the hypothalamus on these glands appears to be mediated largely by the pituitary gland. However, many workers have shown that the hypothalamus has a direct action on the pituitary which is mediated through the pituitary portal system or by a neurohumoral route. There has been some evidence that the hypothalmus has a direct action not only on the pituitary gland but also on other endocrine glands.

The purpose of this work was to determine the action of lipoid extracts of the hypothalamic nuclei on the thyroid, the pituitary, and adrenal glands of normal and castrated female rats. Eighteen adult female rats of the Wistar strain were used; 3 rats served as controls and the remainder were divided into 3 groups of 5 animals each. The first group of animals received daily intramuscular injections of 0.5 c.c. of a colloidal solution of lipoid extract from nuclei of the hypothalamus for a period of 20 days. The animals were sacrificed several hours after the last injection. Ovariectomy was performed on the rats in the second group and they were sacrified 50 days after the operation. Ovariectomy was also performed on the animals in the third group. From the thirtieth to the fiftieth day after removal of the ovaries they received the type of injections of extracts from the hypothalamic nuclei that were given to the animals in the first group and were then sacrificed.

In all the sacrificed animals the thyroid, the pituitary, and the adrenal glands were examined. The tissues were fixed in Bouin's solution and stained with routine and special stains (Mallory-Azan, Hotchkiss-McManus, Feulgen). Changes in the functional activity of the gland were evaluated on the basis of the histologic alterations that were observed.

The changes in the histology of the thyroid gland of the animals in group 1 were suggestive of a marked increase in functional activity of the gland. The thyroid alterations in the animals of the second group also revealed an increase in activity. However, the thyroid glands of the animals in the third group were similar to the controls.

The pituitary glands of the animals in group 1 showed evidence of considerable hyperactivity. In the animals of the second group the pituitary alterations were those usually seen in castrated animals with evidence of increased function. In the third group, the changes in the pituitary gland were less definite but showed some evidence of decreased pituitary function as compared to the animals in the second group.

In regard to the adrenal glands, the results were difficult to evaluate in view of the poor correlation between the histologic appearance of the gland and functional activity.

The author concludes that the hypothalamus does seem to have a direct action on the pituitary and on the thyroid. In the normal animal this action is one of stimulation whereas in the castrated female animal it is one of regulation. —*R. Menguy, M.D.*

The Incidence of Thyrotoxicosis Among Refugees from Nazi Prison Camps. SAMUEL A. WEISMAN. *Ann. Int. M.*, 1958, 48: 747.

THIS STUDY was stimulated by the impression that there was a high incidence of thyrotoxicosis among patients who were refugees from Nazi prison camps. The histories of these patients were all similar. They had all been subjected to uncommon stress over a prolonged period of time.

During the period of study, 256 patients were studied in the thyroid clinic of the Cedars of Lebanon Hospital, Los Angeles. Sixty-three of this group were refugees (24.6 per cent). During this time, there were 5,155 patients registered in the General Outpatient Clinic, of whom 601 (13.2 per cent) were refugees.

Toxic goiter was diagnosed in 63 patients. Of these, 23 were refugees. This incidence is striking in view of the fact that only 13.2 per cent of the clinic population were refugees. Thus, the incidence was more than three times that found in the nonrefugee group. Similar ratios occurred in the groups with combined Graves' disease and toxic nodular goiter, and combined Graves' disease, toxic nodular goiter, and questionable toxic goiter.

While many persons are subjected to emotional stress, only a few develop thyrotoxicosis or some other malfunction. The factors which determine the development of a malfunction are inherent constitutional make-up and the severity and duration of emotional stress. With these facts in mind, it is thought that the observations above constitute further evidence that individuals, especially those genetically predisposed, will manifest pathophysiologic disturbances under sufficient duress. Among these disturbances is thyrotoxicosis, and considering that the incidence of thyrotoxicosis is so much higher in the refugee group as compared with the nonrefugee group, it is believed that these facts lend support to the view that emotional stress is an important contributing factor in the development of thyrotoxicosis.

—*John J. Bergan, M.D.*